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The separate section on "On-going Research Projects" has been eliminated from this issue. The Smithsonian Science Information Exchange (SSIE) ended its work October 1, 1981, and transfer of such efforts to the National Technical Information Service (NTIS) has not been completed. NASA plans to resume this section in an early issue of *STAR* Volume 20 (1982). Comments on this section and its usefulness are welcome and should be sent to the NASA Scientific and Technical Information Branch (NST-44), Washington, DC 20546.

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For related information see also *Astronautics*.

Each major division is further divided into as many as nine specific categories, which are identified by category numbers.

Abstracts in *STAR* are grouped by specific category, the categories appearing in sequential order. Category breaks in the abstract section are identified by the category number and title, and a scope note. Cross-references to other categories are provided as appropriate. For example:

02 AERODYNAMICS

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For related information see also *07 Aircraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion*.

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SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences.*

88 SPACE SCIENCES (GENERAL) N.A.

89 ASTRONOMY 134
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS 135
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION 135
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

92 SOLAR PHYSICS 135
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION 136
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine.* For theory see *73 Nuclear and High-Energy Physics.*

GENERAL

99 GENERAL 136

Note: N.A. means that no abstracts were assigned to this category for this issue.

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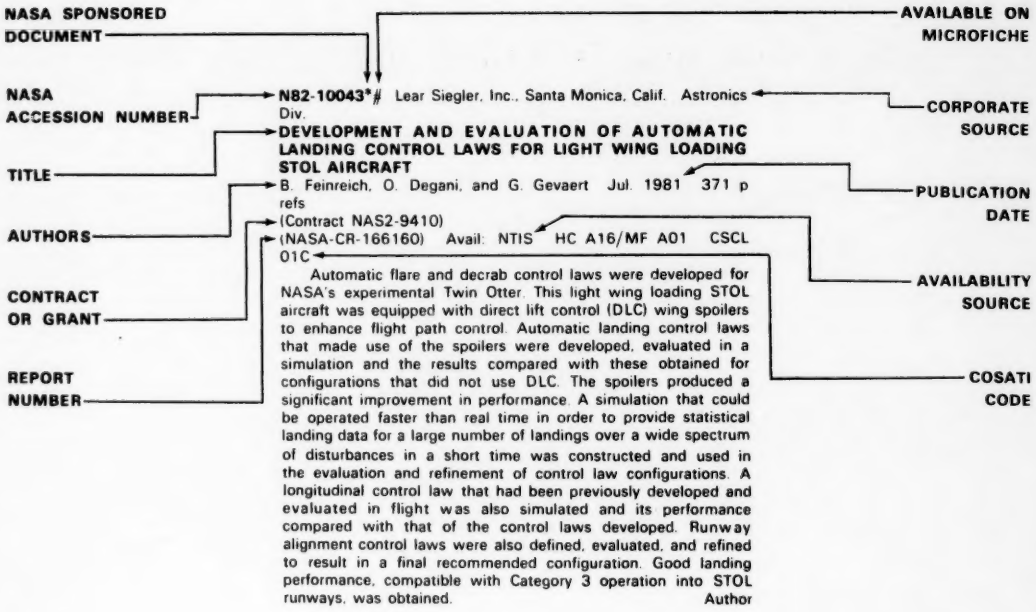
TYPICAL CITATION AND ABSTRACT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N82-10043*# Lear Siegler, Inc., Santa Monica, Calif. Astronics Div.
CORPORATE SOURCE
TITLE
DEVELOPMENT AND EVALUATION OF AUTOMATIC LANDING CONTROL LAWS FOR LIGHT WING LOADING STOL AIRCRAFT
PUBLICATION DATE
AUTHORS
B. Feinreich, O. Degani, and G. Gevaert Jul. 1981 371 p refs
CONTRACT OR GRANT
(Contract NAS2-9410)
AVAILABILITY SOURCE
REPORT NUMBER
(NASA-CR-166160) Avail: NTIS HC A16/MF A01 CSCL 01C
COSATI CODE
Automatic flare and decrab control laws were developed for NASA's experimental Twin Otter. This light wing loading STOL aircraft was equipped with direct lift control (DLC) wing spoilers to enhance flight path control. Automatic landing control laws that made use of the spoilers were developed, evaluated in a simulation and the results compared with these obtained for configurations that did not use DLC. The spoilers produced a significant improvement in performance. A simulation that could be operated faster than real time in order to provide statistical landing data for a large number of landings over a wide spectrum of disturbances in a short time was constructed and used in the evaluation and refinement of control law configurations. A longitudinal control law that had been previously developed and evaluated in flight was also simulated and its performance compared with that of the control laws developed. Runway alignment control laws were also defined, evaluated, and refined to result in a final recommended configuration. Good landing performance, compatible with Category 3 operation into STOL runways, was obtained.
Author

VOLUME 20 NUMBER 1/JANUARY 8, 1982

Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

01 AERONAUTICS (GENERAL)

N82-10001*# National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, Calif.
ANALYTIC STUDY OF ORBITER LANDING PROFILES
Harold J. Walker Sep. 1981 115 p refs
(NASA-TM-81365; H-1160) Avail: NTIS HC A06/MF A01 CSCL 01B

A broad survey of possible orbiter landing configurations was made with specific goals of defining boundaries for the landing task. The results suggest that the center of the corridors between marginal and routine represents a more or less optimal preflare condition for regular operations. Various constraints used to define the boundaries are based largely on qualitative judgements from earlier flight experience with the X-15 and lifting body research aircraft. The results should serve as useful background for expanding and validating landing simulation programs. The analytic approach offers a particular advantage in identifying trends due to the systematic variation of factors such as vehicle weight, load factor, approach speed, and aim point. Limitations such as a constant load factor during the flare and using a fixed gear deployment time interval, can be removed by increasing the flexibility of the computer program. This analytic definition of landing profiles of the orbiter may suggest additional studies, including more configurations or more comparisons of landing profiles within and beyond the corridor boundaries.
J.M.S.

N82-10002# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Abteilung Festigkeit.
MATHEMATICAL MODEL FOR THE MAINTENANCE PROGRAM OF MODERN JET AIRCRAFT
Rudolf Prinz, Hans-Christian Goetting, Karl-Heinz Galda (Deutsche Lufthansa A.G., Hamburg), and Juergen Kreth (Deutsche Lufthansa A.G., Hamburg) Oct. 1980 44 p refs In GERMAN; ENGLISH summary Report will also be announced as Translatation (ESA-TT-724)
(DFVLR-FB-81-14) Avail: NTIS HC A03/MF A01; DFVLR, Cologne DM 10.40

Step-by-step escalation of structural inspection intervals based on long-term experience with a fleet of transport aircraft is described by a mathematical model. Fundamental to the model are statistical distributions of load and detectable crack length in a fatigue loaded component. Knowing realistic probabilities of failure enables the calculation of appropriate inspection intervals. Calculation procedure yields increasing intervals up to a maximum value and a decrease when approximating the mean value of detectable crack length. As to usual interval steps, the results show good agreement with practice. Restrictions and possible applications of the model are discussed. Author (ESA)

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N82-10003 Polytechnic Inst. of New York, Brooklyn.
THE SUPERSONIC FLOW IN CONICAL CORNERS Ph.D. Thesis
Frank Marconi 1981 74 p
Avail: Univ. Microfilms Order No. 8118884

A computational procedure was developed to predict the inviscid super hypersonic flow field of conical internal corners. The prediction of internal corner flow fields can be important in the design of supersonic box type inlets. The computational procedure utilizes a second order finite difference marching technique to asymptote to the conical corner flow solution of Euler's equations. These flow fields are dominated by complex shock interactions. All discontinuities, shocks and slip surfaces, are fitted with the appropriate jump conditions. The triple points (the interaction of three shocks and a slip surface) are also computed exactly. Computed results are compared with experimental data and the computational result of other investigations. In addition, the sensitivity of these flow fields to a number of geometric parameters is studied, and the impact of these flows on inlet performance is assessed. Dissert. Abstr.

N82-10004 Virginia Polytechnic Inst. and State Univ., Blacksburg.
ACOUSTIC PROPAGATION IN NONUNIFORM CIRCULAR DUCTS CARRYING NEAR SONIC MEAN FLOWS Ph.D. Thesis
Jeffrey Jennings Kelly 1981 150 p
Avail: Univ. Microfilms Order No. 8118699

A linear model based on the wave envelope technique is used to study the propagation of axisymmetric and spinning acoustic modes in hardwalled and lined nonuniform circular ducts carrying neat sonic mean flows. This method is valid for large as well as small axial variations, as long as the mean flow does not separate. A numerical procedure, which is stable for cases of strong interaction, for analysis of nonlinear acoustic propagation through nearly sonic mean flows is also developed. The numerical results show that an impedance condition can be satisfied at the duct exit and a corresponding solution obtained. The numerical results confirm that the nonlinearity intensifies the acoustic disturbance in the throat region, reduces in intensity of the fundamental frequency at the duct exit, and increases the reflections. This implies that the mode conversion properties of variable area ducts can reflect and focus the acoustic signal to the vicinity of the throat in high subsonic flows. Also the numerical results indicate that a shock develops if certain limits on the input parameters are exceeded. Dissert. Abstr.

N82-10005 West Virginia Univ., Morgantown.
AN INDOOR BLADE TEST FACILITY FOR DETERMINING THE BASIC AERODYNAMIC PROPERTIES OF DARRIEUS

WIND TURBINE AIRFOILS WITH TEST RESULTS FOR AN NACA 0015 AND A MODIFIED SECTION Ph.D. Thesis
Walter Paul Wolfe 1981 332 p
Avail: Univ. Microfilms Order No. 8118421

An indoor facility was developed for use in the aerodynamic testing of Darrieus wind turbine blades. A three component strain gage balance was used to reduce lift, drag, and moment coefficients of blades whose angle of attack, chord to radius ratio and Reynolds number could be systematically varied. A computer data acquisition system was developed to automatically record, reduce, and save the test data. It was learned that the unusual flow field of this test environment necessitates unique induced velocity corrections to the test data. Computer codes were developed to calculate the angles of attack induced at the blade by the trailing tip vortices. The results were then used to correct the test data. The effects of flow curvature on blade aerodynamics were experimentally verified. Both blades demonstrated virtual camber and incidence as evidenced by non-zero moment coefficients and angles of zero lift and minimum drag.
Dissert. Abstr.

N82-10006 George Washington Univ., Washington, D.C.
EFFECT OF DRIVEN WALL MOTION ON BOUNDARY LAYER FLOW Ph.D. Thesis
Leonard Murrey Weinstein 1981 181 p
Avail: Univ. Microfilms Order No. 8117959

A low-speed experimental boundary layer study was conducted over a thin membrane surface model, driven by acoustic horns into a two dimensional standing wave. The influence of an unsteady wall boundary condition on the structure of a zero pressure gradient turbulent boundary layer was examined. Measured quantities included velocity profiles, total drag, turbulent and acoustic fluctuation quantities, Reynolds stress, and wall motion. A simplified theoretical analysis of the interaction of the mean flow with wall induced sound was used to explain some of the results obtained. The model was first examined under a laminar boundary layer. Data taken under this condition showed the effect of the driven wall on measured quantities without considering the effect of turbulence. The wall was then examined at several velocities under a turbulent boundary layer. This gave a combination of wall and flow disturbances. Data indicate the momentum thickness of the boundary layer and the total drag of the driven model did not change from the undriven values, even though the Reynolds stress showed both local and average changes. Dissert. Abstr.

N82-10007 Colorado State Univ., Fort Collins.
ACTIVE MODELING OF TURBULENCE FOR WIND-TUNNEL STUDIES OF BRIDGE MODELS Ph.D. Thesis
Bogusz Bienkiewicz 1981 203 p
Avail: Univ. Microfilms Order No. 8119691

In a method, for turbulence generation, an additional energy is supplied to the mean flow by stirring air in an active manner. Two arrays of symmetric airfoils are placed in the mean flow and oscillate pseudorandomly driven by an appropriate servo-system and input driving signals. Vertical and horizontal velocity components are of main interest. It is possible to generate turbulence of prescribed characteristics for the two velocity components of interest provided that the experimental configuration of the generator is correctly selected. Measured velocity spectra are in good agreement with the target spectra, especially in the low-frequency range. The integral scales of turbulence are aproximately one order of magnitude larger than the scales of a typical grid turbulence generated in the same wind-tunnel conditions. The length and the ratio of the scales can be varied. The proposed active turbulence generator can be conveniently used in the wind tunnel studies to determine the effects of turbulence length scale upon the aerodynamic response of bridge section models. Dissert. Abstr.

N82-10008 California Inst. of Tech., Pasadena.
A PETROV-GALERKIN FINITE ELEMENT FORMULATION FOR CONVECTION DOMINATED FLOWS Ph.D. Thesis
Alexander Nelson Brooks 1981 126 p
Avail: Univ. Microfilms Order No. 8118601

The basis of the formulation is the streamline upwind concept, which provides an accurate multidimensional generalization of optimal one dimensional upwind schemes. When implemented as a consistent Petrov-Galerkin weighted residual method, it is shown that the formulation is not subjected to the artificial diffusion criticisms associated with many classical upwind methods. The effectiveness of the streamline upwind/Petrov-Galerkin formulation for the linear advection diffusion equation is demonstrated with numerical examples. The formulation is extended to the treatment of the incompressible Navier-Stokes equations. An efficient implicit pressure/explicit velocity transient algorithm is developed which allows for several treatments of the incompressibility constraint and for multiple iterations within a time step. The algorithm is demonstrated on the problem of vortex shedding from a calculate cylinder at a Reynolds number of 100. Dissert. Abstr.

N82-10009 California Inst. of Tech., Pasadena.
A MODEL FOR THE VON KARMAN VORTEX STREET Ph.D. Thesis
James Carl Schatzman 1981 118 p
Avail: Univ. Microfilms Order No. 8118980

In the wake of a two dimensional bluff body placed in a uniform stream, for sufficiently large but not too large flow velocity a distinctive pattern of vorticity is observed. The pattern consists of vortices of high vorticity surrounded by nearly irrotational fluid. These vortices are organized in two nearly parallel staggered rows of vortices of opposite direction of rotation. This pattern is called the von Karman vortex street. A model for the von Karman vortex street is analyzed. The model is inviscid, incompressible, two dimensional and consists of vortices of finite area and uniform voraticity. Calculations of steady solutions of the Euler equations and an analysis of the stability of steady solutions for two dimensional disturbances are described. The calculations indicate that the vortex wake can be stabilized by sufficiently large area of the vortices. Data are given which (to some approximation) will permit relating the street to the flow past a body.
Dissert. Abstr.

N82-10010*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A NEW SOLUTION-ADAPTIVE GRID GENERATION METHOD FOR TRANSONIC AIRFOIL FLOW CALCULATIONS
S. Nakamura (Ohio State Univ., Columbus) and T. L. Holst Oct. 1981 21 p refs
(Contract NCA2-OR565-901)
(NASA-TM-81330; A-8733) Avail: NTIS HC A02/MF A01 CSCL 01A

The clustering algorithm is controlled by a second-order, ordinary differential equation which uses the airfoil surface density gradient as a forcing function. The solution to this differential equation produces a surface grid distribution which is automatically clustered in regions with large gradients. The interior grid points are established from this surface distribution by using an interpolation scheme which is fast and retains the desirable properties of the original grid generated from the standard elliptic equation approach. T.M.

N82-10011*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
OIL-FLOW SEPARATION PATTERNS ON AN OGIVE FOREBODY
Earl R. Keener Oct. 1981 32 p refs Presented at 14th AIAA Atmospheric Flight Mech. Conf., Danvers, Mass., 11-13 Aug. 1980
(NASA-TM-81314; A-8650) Avail: NTIS HC A03/MF A01 CSCL 01A

Oil flow patterns on a symmetric tangent ogive forebody having a fineness ratio of 3.5 are presented for angles of attack up to 88 deg at a transitional Reynolds number of 8 million (based on base diameter) and a Mach number of 0.25. Results show typical surface flow separation patterns, the magnitude of surface flow angles, and the extent of laminar and turbulent flow for symmetric, asymmetric, and wakelike flow regimes.
Author

N82-10012*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE STRUCTURE OF TRAILING VORTICES GENERATED BY MODEL ROTOR BLADES

C. Tung, S. L. Pucci, F. X. Caradonna, and H. A. Morse Aug. 1981 23 p refs Presented at Seventh European Rotorcraft and Powered Lift Aircraft Forum, Garmisch-Partenkirchen, West Germany, 8-11 Sep. 1981 Prepared in cooperation with Army Aviation Research and Development Command, Moffett Field, Calif.
(NASA-TM-81316; A-8683; USAAVRADCOM-TR-81-A-25) Avail: NTIS HC A02/MF A01 CSCL 01A

Hot-wire anemometry to analyze the structure and geometry of rotary wing trailing vortices is studied. Tests cover a range of aspect ratios and blade twist. For all configurations, measured vortex strength correlates well with maximum blade-bound circulation. Measurements of wake geometry are in agreement with classical data for high-aspect ratios. The detailed vortex structure is similar to that found for fixed wings and consists of four well defined regions--a viscous core, a turbulent mixing region, a merging region, and an inviscid outer region. A single set of empirical formulas for the entire set of test data is described. S.L.

N82-10013# Colorado Univ. at Boulder. Dept. of Aerospace Engineering Sciences.
APPLICATION OF A SHOCK-TURBULENT BOUNDARY LAYER INTERACTION THEORY IN TRANSONIC FLOW FIELD ANALYSIS
G. R. Inger 18 Feb. 1980 14 p refs Presented at Transonic Perspective: A Critique of Transonic Flow Res., Ames, Calif., 18-20 Feb. 1981
(Contract N00014-80-C-0470)
(AD-A103244) Avail: NTIS HC A02/MF A01 CSCL 20/4

This paper describes the application of non-asymptotic triple-deck theory of transonic shock-turbulent boundary layer interaction as a local modular element in the global calculation of supercritical airfoil flow fields. Author (GRA)

N82-10014# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Flugzeuge - Entwicklung.
CALCULATION OF THE VISCOUS FLOW ABOUT AN INFINITE STREAMLINED AIRFOIL WITH FLAPS, MAKING USE A PANEL METHOD BY WOODWARD AND DVORAK Thesis - Hochschule der Bundeswerhr, Munich [DIE BERECHNUNG DER VISKOSEN STROEMUNG UM UNENDLICH GEPFEILTE TRAGFLUEGEL MIT KLAPPEN UNTER ZUHILFENAHME EINES PANELVERFAHRENS NACH WOODWARD UND DVORAK]
Ludwig Gilg 24 Sep. 1980 315 p refs In GERMAN
(MBB-FE-122/S/PUB/35) Avail: NTIS HC A14/MF A01

A computer program, based on an extant method by Woodward and Dvorak, for the calculation of incompressible flow about a multielement streamlined airfoil configuration with infinite wing span and dependent on viscous influences was eleborated. The airfoil configuration with a maximum of one slat and up to two flaps is described as panels. Using a two-dimensional vortex grid and potential formulation, frictionless flow and the resulting pressure distribution as well as the aerodynamic coefficients for lift and pitching moment are established. By iteration, between potential calculation and boundary layer calculation, there converges a stable solution while overall aerodynamic coefficients for lift, pitching moment, and drag can be derived as a function of Reynolds number. Author (ESA)

N82-10015# Stuttgart Univ. (West Germany). Inst. fuer Aerodynamik und Gasdynamik.
THE EFFECT OF AIRFOIL CHARACTERISTICS ON FLAPPING AND ROTOR FORCES OF TWO-BLADE TURBINES WITH FLAPPING JOINTS AND FLAP-PITCH COUPLING, UNDER THE INFLUENCE OF GUST BONDING [DER EINFLUSS VON PROFILEIGENSCHAFTEN AUF SCHLAGBEWEGUNG UND ROTORKRAEFT VON ZWEIBLATT-WINDTURBINEN MIT SCHLAGGELENKEN UND BLATTWINKELRUECKSTEUERUNG UNTER BOEENBELASTUNG]
Gervino A. Walter Aug. 1979 104 p refs In GERMAN; ENGLISH summary
(Contract BMFT-PLE-ET-4086-A)
(IAG-79-15) Avail: NTIS HC A06/MF A01

A problem fitted discretization using a supporting point calculation technique was chosen as a useful compromise between computational time and accuracy of the solutions. The effects of airfoil aerodynamics were investigated on a squall front with a gust factor of two, comparing the cases of the single-blade and the two-blade rotor, respectively with and without flap-pitch coupling. The effects of airfoil drag and gravitation are clearly seen in the flow behavior at the rotor blades, the useful torque, the rotor pitch, and yaw behavior, using blades without flap-pitch coupling. Various types of squall front or pulse gusts are discussed. Author (ESA)

N82-10016# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).
STANDARD TESTS OF A RESEARCH MODEL ROTOR IN A WIND TUNNEL, INCLUDING MODEL SIMILARITY [STANDARD-ERPROBUNG DES FORSCHUNGS-MODELLROTORS IM WINDKANAL, EINSCHLIESSLICH MODELLVERGLEICHEN]
R. Stricker, V. Mikulla, and E. Allramseder Bonn Bundesministerium der Verteidigung 1979 93 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium der Verteidigung (BMVg-FBWT-79-16) Avail: NTIS HC A05/MF A01; Dokzentbw, Bonn DM 30

A wind tunnel test program was developed, as a basis the actual flight regime of the BO-105 helicopter. Operation of the test stand and calibration of measuring devices is described. The procedure for data reduction (digital programs) is given. Results include the parameters: mean and fluctuating components of rotor forces and moments; blade bending moments (flapping, lagging); and control forces. Control and static stability derivatives are also determined. The calculations done for comparison with measurements, using aerodynamic/aeroelastic/flight mechanic digital programs, show in almost all cases very good agreement with model test results. The correlation with flight test data of the BO-105 helicopter shows that model similarity according to the most important scaling laws is fulfilled to a high degree and that the results can be used for real comparison of various sizes of hingeless helicopter rotors. Author (ESA)

N82-10017# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Inst. fuer Experimentelle Stroemungsmechanik.
EXPERIMENTAL INVESTIGATIONS OF THE SEPARATED FLOW AROUND A RECTANGULAR WING
Hans Bippes, Michael Turk, and Klaus Jacob Oct. 1980 56 p refs In GERMAN; ENGLISH summary
(DFVLR-FB-81-12) Avail: NTIS HC A04/MF A01; DFVLR, Cologne DM 10

For the aspect ratios lambda = 3.1 and 2.3, pressure distributions over the whole span were measured at angles of attack up to alpha approximately = 27 deg. For selected cases, oil flow patterns were produced and velocity profiles behind the wing along with shear stresses at the surface were measured. Most of the model and the experiments were carried out at Re approximately = 2,100,000 and M approximately = 0.17. The model and the experiments are described. The results are discussed and partly compared with results from a theoretical model. Author (ESA)

N82-10018# European Space Agency, Paris (France).
DRAG MEASUREMENTS OF CONICAL AFTERBODIES AT SUBSONIC AND TRANSONIC SPEEDS
Helmut Esch Apr. 1981 61 p refs Transl. into ENGLISH of "Widerstandsmessungen and Konischen Heckkoerpern in Unterschallu. Niedrigen Transschall" DFVLR Rept. FB-79-27 DFVLR, Goettingen, West Germany 22 May 1979 Original report in GERMAN previously announced as N80-25302
(ESA-TT-646; DFVLR-FB-79-27) Avail: NTIS HC A04/MF A01; DFVLR, Cologne DM 10.40

The drag of open conical afterbodies of missile bodies was measured at angles of incidence up to 20 deg. The speeds were in the subsonic and lower transonic Mach range at Reynolds numbers, based on body diameter, between 500,000 and 1,300,000. At zero incidence, the results allow a drag optimization for constant afterbody lengths and for constant base diameters. Author (ESA)

N82-10019# European Space Agency, Paris (France).
THEORETICAL PREDICTION OF THE BASE PRESSURE FOR TWO-DIMENSIONAL TURBULENT BASE FLOWS AT SUPERSONIC VELOCITIES
Mauri Tanner Jul. 1981 92 p refs Transl. into ENGLISH of "Theoretische Bestimmung des Basisdruckes fuer zweidimensionale turbulente totwasserstroemungen bei ueberschallgeschwindigkeiten", DFVLR Rept. EB-80-19 DFVLR Goettingen, West Germany May 1980 Original report in GERMAN previously announced as N81-13928
(ESA-TT-674; DFVLR-FB-80-19) Avail: NTIS HC A05/MF A01; DFVLR, Cologne DM 17,20

The essential physical foundation of the theory is the theory of Oswatitsch, which gives the connection between the drag of the body and entropy in the flow. In flow over a simple step, the base pressure calculated by the theory is in good agreement with experimental results. The influence of boundary layer thickness on the base pressure is realistically dealt with. The influence of boattail on base pressure can be determined, as can the influence of forebody drag. Application of the theory to symmetrical wedges indicates good agreement between theory and experiment. The influence of the angle of incidence on the base pressure can be calculated for thin profiles at small angles of incidence. The theoretical results for thin wedges show that the base pressure becomes smaller with increasing angle of incidence. Author (ESA)

N82-10020# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
AIRCRAFT EXCRESCENCE DRAG
A. D. Young, J. H. Paterson, and J. Lloyd Jones, ed. Jul. 1981 172 p refs
(AGARD-AG-264; ISBN-92-835-1392-4) Avail: NTIS HC A08/MF A01

A review was undertaken of the available data on the subject of the drag of excrescences on aircraft surfaces. Information from this review is summarized and presented in a way that is readily usable for prediction and design purposes. The basic characteristics of boundary layers are discussed and, where possible, the drag of excrescences is related to those characteristics. In particular, because the size of many types of surface imperfection is small in comparison with boundary layer thicknesses, the drag of such imperfections can be correlated in terms of the properties of inner regions of the boundary layer. Several previously published analyses of this type are highlighted and, where possible, extensions to other data sources or other types of excrescence are presented. The practical problems of applying these data in the varying velocity gradients existing on aircraft surface are treated and one section is devoted to the drag of auxiliary air inlet and exit openings. Gaps in existing data which offer opportunities for research effort are pointed out. J.M.S.

N82-10981# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
FINITE DIFFERENCE COMPUTATION OF THE STEADY TRANSONIC POTENTIAL FLOW AROUND AIRPLANES
Luo Shijun, Zheng Yuwen, Qian Hong, and Wang Dieqian *In its* Recent Selected Papers of NW Polytech. Univ., pt. 1 (FTD-ID(RS)T-0259-81-Pt-1) 20 Aug. 1981 p 5-30 refs Transl. into ENGLISH from Recent Selected Papers of NW Polytech. Univ., pt. 1 (Xian Shaanxi), 1979 (For primary document see N82-10980 01-99)
Avail: NTIS HC A17/MF A01

N82-10982# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SECOND ORDER APPROXIMATION THEORY OF AN ARBITRARY AEROFOIL IN COMPRESSIBLE POTENTIAL FLOW
Lin Chaoqiang *In its* Recent Selected Papers of NW Polytech. Univ., pt. 1 (FTD-ID(RS)T-0259-81-Pt-1) 20 Aug. 1981 p 31-50 refs Transl. into ENGLISH from Recent Selected Papers of NW Polytech. Univ., pt. 1 (Xian Shaanxi), 1979 (For primary document see N82-10980 01-99)
Avail: NTIS HC A17/MF A01

N82-10983# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
AERODYNAMIC CALCULATIONS AND DESIGN OF SUBCRITICAL AEROFOILS
Lin Chaoqiang *In its* Recent Selected Papers of NW Polytech. Univ., pt. 1 (FTD-ID(RS)T-0259-81-Pt-1) 20 Aug. 1981 p 51-64 refs Transl. into ENGLISH from Recent Selected Papers of NW Polytech. Univ., pt. 1 (Xian Shaanxi), 1979 (For primary document see N82-10980 01-99)
Avail: NTIS HC A17/MF A01

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation*.

N82-10021*# Kansas Univ. Center for Research, Inc., Lawrence. Flight Research Lab.
ICING TUNNEL TEST OF A GLYCOL-EXUDING POROUS LEADING EDGE ICE PROTECTION SYSTEM ON A GENERAL AVIATION AIRFOIL Final Report
David L. Kohlman, William G. Schweikhard, and Alan E. Albright Sep. 1981 37 p refs
(Grant NAG3-71)
(NASA-CR-165444; KU-FRL-464-1) Avail: NTIS HC A03/MF A01 CSCL 01C

Test results show that the system is very effective in preventing ice accretion (anti-ice mode) or removing ice from an airfoil. Minimum glycol flow rates required for antiicing are a function of velocity, liquid water content in the air, ambient temperature, and droplet size. Large ice caps were removed in only a few minutes using anti-ice flow rates, with the shed time being a function of the type of ice, size of the ice cap, angle of attack, and glycol flow rate. Wake surveys measurements show that no significant drag penalty is associated with the installation or operation of the system tested. T.M.

N82-10022# Committee on Science and Technology (U. S. House).
SPIN RECOVERY TRAINING
Washington GPO 1980 15 p Presented by the Subcomm. on Invest. and Oversight of the Comm. on Sci. and Technol., 96th Congr., 2nd Sess., Jul. 1980
(GPO-66-020) Avail: Subcommittee on Investigations and Oversight

The FAA policy of not requiring spin recovery training as a prerequisite for a private pilot license was examined in an effort to determine if such a requirement would result in a net savings of life. Only FAA remained adamant in defense of the no-spin training policy. All other witnesses, to varying degrees, expressed the need for spin and recovery training as a common sense safety requirement. It can be concluded without equivocation that experienced aviators overwhelmingly demand that aspiring pilots be trained to protect themselves and be able to recover from post stall gyrations, incipient spins, and spins. The subcommittee's recommendations that such training be required for licensing is discussed with emphasis on the development of a flight training manual and an implementation plan. A.R.H.

N82-10023# Naval Postgraduate School, Monterey, Calif. Dept. of Operations Research.
A PROPOSED FLIGHT SAFETY PROGRAM FOR THE KOREAN AIR FORCE M.S. Thesis
Chong Kwan Lee Mar. 1981 136 p refs
(AD-A102373) Avail: NTIS HC A07/MF A01 CSCL 05/1

Several methodologies relevant to the development of a safety program for the Korean Air Force were reviewed. Methodologies considered included: Control charts; System safety analysis; and Critical incident technique. Data collection methods applicable to accident analysis were proposed. Recommendations for the incorporation of these methods into a safety program for the K.A.F. were developed. The safety program described in this

thesis possesses the potential for reducing overall operational costs and maximizing aircraft availability. The end result of such a program can only serve to increase operational readiness and thereby maximize overall efficiency and military capability of the K.A.F. GRA

N82-10024# Research Inst. of National Defence, Stockholm (Sweden). Huvudavdelning 2.
LIGHTNING EFFECTS ON AIRCRAFT AND COMPOSITES. LITERATURE STUDY ON LIGHTNING STRIKES AND PROTECTION [VERKAN AV BLIXT I FLYGPLAN OCH KOMPOSITER. LITTERATURSTUDIE OEVER SKADOR OCH SKYDD]
Anita Alm Nov. 1980 102 p refs In SWEDISH
(FOA-C-20388-F9) Avail: NTIS HC A06/MF A01

The frequency and different types of lightning strike on different parts of aircraft and several ways of protection against direct and indirect lightning effects were reviewed. Fiber composites, lightning damage and testing of lightning protection for modern aircraft material are studied by means of simulation techniques. Unshielded composite materials are damaged by lightning. With a correctly shaped lightning shield damage can be prevented. Author (ESA)

N82-10025# Societe Nationale Industrielle Aerospatiale, Paris (France).
COST REDUCTION IN AIR TRANSPORTATION
P. Lebouc 1980 21 p Presented at French Aerospace Week, Indonesia, 8-12 Dec. 1980
(SNIAS-811-150-101) Avail: NTIS HC A02/MF A01

Historical trends in costs are reviewed. By adopting fuel conservation policies, such as renewal of the jet fleet, adaptation of flight operation, and modification of air traffic control procedures, the airlines can limit the effect of expected fuel price increases. In parallel, productivity gains should keep at a constant level all the other costs of airline operations. Under the above conditions, growth of the industry seems to be certain even if fuel prices increase at a rate of 2 to 4% per year above inflation during the next 20 years. Author (ESA)

N82-10026# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Bonn (West Germany). Inst. fuer Flugmedizin.
DEVELOPMENT AND CONSTRUCTION OF PILOT EJECTOR SEATS IN GERMANY FROM 1938-1945
Siegfried Ruff Feb. 1981 110 p refs In GERMAN; ENGLISH summary
(DFVLR-FB-81-04) Avail: NTIS HC A06/MF A01; DFVLR, Cologne DM 26

Pioneering research, leading to the development of an ejector seat for the Junkers Ju 88, is reviewed. Fundamentals in establishing human acceleration tolerances are discussed. The experimental simulation of shock induced acceleration is described, and human resistance is quantified. Exploitation and follow-up of accident related data are summarized, including investigations of the accelerations experienced with an aircraft out of control, e.g., shot down. The action of airspeed pressure on a person is considered, and experience gained with research aircraft is recounted. Measuring methods for technical and physiological parameters are indicated. The beginning of ejector seat development in England, Sweden, and the U.S. (1944-45) is also briefly reviewed in comparison. Author (ESA)

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications.*

N82-10027# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
THE STATISTICAL THEORY OF RADIO DIRECTION FINDING
R. L. Holland Jun. 1981 47 p refs
(Contract N00024-81-C-5301)
(AD-A104156; JHU/APL/TG-1330) Avail: NTIS HC A03/MF A01 CSCL 17/3

The statistical theory of radio direction finding as it applied to three-dimensional geometrics is presented in this report. This theory is an extension of the two-dimensional theory presented by R. G. Stansfield in 1947. The theory has application in situations where airborne targets are maneuvering in three dimensions at high speed, especially when the platforms with the direction finding equipment are also aircraft. Author (GRA)

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

N82-10028*# Wyle Labs., Inc., Huntsville, Ala.
EXPERIMENTAL MODAL ANALYSIS OF THE FUSELAGE PANELS OF AN AERO COMMANDER AIRCRAFT Final Report
David Geisler Sep. 1981 164 p refs Prepared in cooperation with Structural Dynamics Res. Corp., Cincinnati, Ohio
(Contract NAS1-14693)
(NASA-CR-165750; Rept-10568) Avail: NTIS HC A08/MF A01 CSCL 01C

The reduction of interior noise in light aircraft was investigated with emphasis the thin fuselage sidewall. The approach used is theoretical and involves modeling of the sidewall panels and stiffeners. Experimental data obtained from tests investigating the effects of mass and stiffness treatments to the sidewalls are presented. The dynamic characteristics of treated panels are contrasted with the untreated sidewall panels using experimental modal analysis techniques. The results include the natural frequencies, modal dampling, and mode shapes of selected panels. Frequency response functions, data relating to the global fuselage response, and acoustic response are also presented. J.M.S.

N82-10029*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
V/STOL AIRCRAFT AND FLUID DYNAMICS
Leonard Roberts (Stanford Univ., Calif.) and Seth B. Anderson Oct. 1981 8 p refs
(NASA-TM-81328; A-8730) Avail: NTIS HC A02/MF A01 CSCL 01C

The impact of military applications on rotorcraft and V/STOL aircraft design is summarized with respect to fixed-wing aircraft. The influence of the mission needs on the configurational design of V/STOL aircraft, the implications regarding some problems in fluid dynamics relating to propulsive flows, and their interaction with the aircraft and the ground plane, are also considered. Additional research in fluid dynamics that can contribute to an improvement in performance of V/STOL aircraft is suggested. B.W.

N82-10030*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
AN INVESTIGATION OF A STOPPABLE HELICOPTER ROTOR WITH CIRCULATION CONTROL
John D. Ballard, John L. McCloud, III, and T. J. Forsyth Aug. 1980 372 p refs
(NASA-TM-81218; A-8278) Avail: NTIS HC A16/MF A01 CSCL 01C

A stoppable helicopter rotor with circulation control was investigated in the Ames 40 by 80 foot wind tunnel. The model was tested as a rotating wing, a fixed wing, and during transition start/stop sequences. The capability of the model's control system to maintain pitch and roll moment balance during the start/stop sequence, the ability of the blades to withstand the start/stop loads, the adequacy of the control system to maintain balance in the helicopter mode, and the control system capabilities in

the fixed-wind mode were assessed. Time-history data of several start/stop sequences of the X-wing rotor, and the steady-state data relating to the model as both a rotor and as a fixed-wing aircraft are presented. In addition, stability data are presented which were acquired during open-loop and closed-loop tests of the hub moment feedback control system. J.M.S.

N82-10031*# National Aeronautics and Space Administration, Washington, D. C.
QUIET SHORT-HAUL RESEARCH AIRCRAFT FAMILIARIZATION DOCUMENT, REVISION 1
Joseph C. Eppel Sep. 1981 81 p refs
(NASA-TM-81298; A-8601) Avail: NTIS HC A05/MF A01 CSCL 01C

The design features and general characteristics of the Quiet Short Haul Research Aircraft are described. Aerodynamic characteristics and performance are discussed based on predictions and early flight test data. Principle airplane systems, including the airborne data acquisition system, are also described. The aircraft was designd and built to fulfill the need for a national research facility to explore the use of upper surface blowing, propulsive lift technology in providing short takeoff and landing capability, and perform advanced experiments in various technical disciplines such as aerodynamics, propulsion, stability and control, handling qualities, avionics and flight control systems, trailing vortex phenomena, acoustics, structure and loads, operating systems, human factors, and airworthiness/certification criteria. An unusually austere approach using experimental shop practices resulted in a low cost and high research capability. Author

N82-10032*# Old Dominion Univ., Norfolk, Va. Dept. of Mechanical Engineering and Mechanics.
COMPARATIVE STUDY OF FLARE CONTROL LAWS Final Report, 15 Dec. 1979 - 15 Oct. 1981
A. A. Nadkarni Oct. 1981 52 p refs
(Grant NsG-1480)
(NASA-CR-164903) Avail: NTIS HC A04/MF A01 CSCL 01C

The development of a digital, three dimensional, automatic control law designed to achieve an optimal transition of a B-737 aircraft between glide slope conditions and the desired final touchdown condition is presented. The digital control law is a time invariant, state estimate feedback law, and the design is capable of using the microwave landing system. Major emphesis is placed on the reduction of aircraft noise in communities surroundings airports, the reduction of fuel consumption, the reduction of the effects of adverse weather conditions on aircraft operations, and the efficient use of airspace in congested terminal areas. Attention is also given to the development of the capability to perform automatic flares from steep glide slopes to precise touchdown locations. B.W.

N82-10033# Aberdeen Univ. (Scotland). Dept. of Engineering.
APPLICATION OF NUMERICAL METHODS TO THE CALCULATION OF ELECTROSTATIC FIELDS IN AIRCRAFT FUEL TANKS Final Scientific Report, 1 Jul. 1980 - 30 Jun. 1981
J. R. Smith, P. Lees, and D. McAllister Aug. 1981 65 p refs
(Grant AF-AFOSR-0223-80; AF Proj. 2301; AF Proj. 3048)
(AD-A103270; EOARD-TR-81-9) Avail: NTIS HC A04/MF A01 CSCL 01/3

The solution of electrostatic field problems occurring during the refueling of aircraft fuel tanks containing explosion suppressant foams is discussed. A computational model of a fuel tank is set up, and the finite element method is used to calculate the electrostatic potential distribution within the tank. Author (GRA)

N82-10034# Boeing Military Airplane Development, Seattle, Wash.
LOW MAINTENANCE HYDRAULIC ACCUMULATOR Final Report, Aug. 1976 - Dec. 1980
E. C. Wagner and W. E. Willard Jun. 1981 65 p
(Contract F33615-76-C-2088; AF Proj. 3145)
(AD-A103947; AFWAL-TR-81-2031) Avail: NTIS HC A04/MF A01 CSCL 13/7

This report presents the results of a program to develop a low maintenance accumulator, compatible with current MS envelopes and competitive in cost with conventional accumulators. The purpose of the program was to select and develop a metal bellows configuration/concept to replace the conventional moving piston and seal of conventional accumulators. The selected bellows are of welded construction and welded in place to allow bellows movement identical to piston movement. The accumulator housing is of welded construction to eliminate all possible leak points. The program goal was to develop an accumulator to provide a ten year unserviced life. Test results indicate an accumulator design is possible to achieve a service life of 6 to 10 years based on installation on an F-16 aircraft. Author (GRA)

N82-10035# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Flugzeuge.
A CFRP TAILERON FOR THE TORNADO: CONSTRUCTION AND PRODUCTION [CFK-TAILERON FUER DEN TORNADO: KONSTRUKTION UND FERTIGUNG]
L. Lemmer, W. Hartmann, and R. Guenther 1980 67 p In GERMAN Presented at Gastvortrag im KL 624, Mannheim, West Germany, 10-14 Nov. 1980
(MBB-FE-212/KFK/PUB/2) Avail: NTIS HC A04/MF A01

A CFRP lightweight structure, i.e., CFRP taileron, for the Tornado aircraft was developed. The CFRP taileron is interchangeable with the currently used metal horizontal stabilizer as far as geometry, function and durability are concerned while a 30% weight reduction is achieved with CFRP construction. The assembly of the CFRP taileron is detailed and results from static, dynamic, and vibration testing of the structure are presented. A series production method is then outlined, including inspection and certification procedures. Author (ESA)

N82-10036# European Space Agency, Paris (France).
THEORETICAL INVESTIGATION OF THE INFLUENCE OF SPOILER DYNAMICS ON THE HANDLING QUALITIES OF AN AIRCRAFT WITH DIRECT LIFT CONTROL
Dieter Schafranek Jul. 1981 66 p refs Transl. into ENGLISH of "Theoretische Untersuchung ueber den Einfluss der Spoilerdynamik auf die Fliegbarkeit eines Flugzeugs mit direkter auftriebssteuerung" Rept. DFVLR-FB-80-07 DFVLR, Brunswick, 1980 Original report in GERMAN previously announced as N81-13975 (ESA-TT-681; DFVLR-FB-80-07) Avail: NTIS HC A04/MF A01; DFVLR, Cologne DM 14.70

Theoretical parameters describing the pilot's workload during aircraft control pitch tracking and flight path tracking tasks on a transport aircraft equipped with spoiler direct lift control (DLC) were studied. The determined parameters are the necessary phase compensation and gain adapation which the pilot must perform, and also the closed loop resonance. The influence of the DLC-gain factor, spoiler actuator rate, and spoiler deflection washout time constant on pilot workload is presented. Simulated time histories of pitch rate and normal acceleration response due to step type control inputs show the corresponding reactions of the various DLC-configurations which are essential for pitch control and flight path control. Direct lift control using spoilers is shown to be sensible for the aircraft in the test only if the pitching moment of the spoiler is completely compensated, the time constant for the spoiler deflection washout is not too small (greater than 5 seconds) and if the spoiler moves with more delay than the elevator. Author (ESA)

N82-10998# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
MATRIX ANALYSIS OF WINGS
Xu Yuan, Zhu Runziang, Jiang Jinqiag, and Cai Yiuliu *In its* Recent Selected Papers of NW Polytech. Univ., pt. 2 (FTD-ID(RS) T-0260-81-Pt-2) 28 Aug. 1981 p 76-111 refs Transl. into ENGLISH from Recent Selected Papers of NW Polytech. Univ., pt. 2 (Xian Shaanxi), 1979 (For primary document see N82-10996 01-99)
Avail: NTIS HC A18/MF A01

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography*.

No abstracts in this category.

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power*, *28 Propellants and Fuels*, and *44 Energy Production and Conversion*.

N82-10037*# Detroit Diesel Allison, Indianapolis, Ind.
PROPULSION STUDY FOR SMALL TRANSPORT AIRCRAFT TECHNOLOGY (STAT) Contractor Final Report
J. C. Gill, R. V. Earle, D. V. Staton, P. C. Stolp, D. S. Huelster, and B. A. Zolezzi 16 Dec. 1980 186 p refs
(Contract NAS3-21995)
(NASA-CR-165499; DDA-EDR-10470) Avail: NTIS HC A09/MF A01 CSCL 21E

Propulsion requirements were determined for 0.5 and 0.7 Mach aircraft. Sensitivity studies were conducted on both these aircraft to determine parametrically the influence of propulsion characteristics on aircraft size and direct operating cost (DOC). Candidate technology elements and design features were identified and parametric studies conducted to select the STAT advanced engine cycle. Trade off studies were conducted to determine those advanced technologies and design features that would offer a reduction in DOC for operation of the STAT engines. These features were incorporated in the two STAT engines. A benefit assessment was conducted comparing the STAT engines to current technology engines of the same power and to 1985 derivatives of the current technology engines. Research and development programs were recommended as part of an overall technology development plan to ensure that full commercial development of the STAT engines could be initiated in 1988. T.M.

N82-10038*# Detroit Diesel Allison, Indianapolis, Ind.
PROPULSION STUDY FOR SMALL TRANSPORT AIRCRAFT TECHNOLOGY (STAT), APPENDIX B Final Report
[1980] 11 p refs
(Contract NAS3-21995)
(NASA-CR-165499-App-B; DDA-EDR-10470-App-B) Avail: NTIS HC A02/MF A01 CSCL 21E

Data are tabulated for two conceptual engines designed for small transport aircraft. These are the 1790 W (2400 shp) class engine and the 3579 kW (4800 shp) class engine for the 0.5 M sub N and 0.7 M sub N airplanes, respectively. All data points required to perform the STAT missions are provided including take-off, climb, cruise, loiter, and fuel allowances. The weight, dimensions, price, and maintenance costs are given as well as the installation criteria and equations used for adjusting horsepower for gearbox loss, and converting horsepower to thrust. Scaling equations are included. A.R.H.

N82-10039*# United Technologies Research Center, East Hartford, Conn.
DEVELOPMENT OF LOW MODULUS MATERIAL FOR USE IN CERAMIC GAS PATH SEAL APPLICATIONS Final Report
H. E. Eaton and R. C. Novak Oct. 1981 83 p refs
(Contract NAS3-22134)
(NASA-CR-165469; R81-915188-13) Avail: NTIS HC A05/MF A01 CSCL 21E

Three candidate materials were examined: Brunsbond (R) Pad; plasma sprayed porous NiCrAlY; and plasma sprayed low modulus microcracked zirconia. Evaluation consisted of mechanical, thermophysical, and oxidation resistance testing along with optical microscopy and a feasibility demonstration of attaching the material to a suitable substrate. The goals of the program were the following: feasibility of fastening or depositing the low modulus system onto a broad range of substrate alloys; feasibility of depositing or forming the low modulus system to a thickness of 0.19 cm to 0.38 cm; potential to attain a modulus of elasticity in the range of 3.4 to 6.9 GPa (0.5 to 1.0 MSI), and an ultimate strength of 17.2 MPa (2.5 ksi); suitable thermal conductivity; and static oxidation life of at least 1000 hours at 1311 K. The results of the program indicate that all three systems offer attractive properties as a strain isolator material. T.M.

N82-10040*# General Electric Co., St. Petersburg, Fla.
THERMAL-BARRIER-COATED TURBINE BLADE STUDY Final Report
P. A. Siemers and W. B. Hillig Aug. 1981 134 p refs
(Contract NAS3-21727)
(NASA-CR-165351; SRD-81-083) Avail: NTIS HC A07/MF A01 CSCL 21E

The effects of coating TBC on a CF6-50 stage 2 high-pressure turbine blade were analyzed with respect to changes in the mean bulk temperature, cooling air requirements, and high-cycle fatigue. Localized spallation was found to have a possible deleterious effect on low-cycle fatigue life. New blade design concepts were developed to take optimum advantage of TBCs. Process and material development work and rig evaluations were undertaken which identified the most promising combination as ZrO2 containing 8 w/o Y2O3 applied by air plasma spray onto a Ni22Cr-10Al-1Y bond layer. The bond layer was applied by a low-pressure, high-velocity plasma spray process onto the base alloy. During the initial startup cycles the blades experienced localized leading edge spallation caused by foreign objects. T.M.

N82-10984# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
AN AERODYNAMIC DESIGN METHOD FOR TRANSONIC AXIAL FLOW COMPRESSOR STAGE
Zhu Fangynan, Zhou Xinhai, Liu Songling, and Fan Feida *In its* Recent Selected Papers of NW Polytech. Univ., pt. 1 (FTD-ID(RS)T-0259-81-Pt-1) 20 Aug. 1981 p 65-86 refs Transl. into ENGLISH from Recent Selected Papers of NW Polytech. Univ., pt. 1 (Xian Shaanxi), 1979 (For primary document see N82-10980 01-99)
Avail: NTIS HC A17/MF A01

N82-11006# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
INITIAL EXPERIMENTAL RESEARCH INTO THE RESPONSE OF TURBOJET ENGINE COMPRESSORS TO DISTORTION OF INTAKE PRESSURE
Chen Fu-qun, Tang Di-yi, Hu Zi-long, Id Wen-lan, Yu Jin-di, Wu Xin-yuan, Zhao Jue-liang, Lin Qi-xun, Wang Zong-yuan, Liu Si-hong et al *In its* Recent Selected Papers of NW Polytech. Univ., pt. 2 (FTD-ID(RS)T-0260-81-Pt-2) 28 Aug. 1981 p 287-316 refs Transl. into ENGLISH from Recent Selected Papers of NW Polytech. Univ., pt. 2 (Xian Shaanxi), 1979 (For primary document see N82-10996 01-99)
Avail: NTIS HC A18/MF A01

N82-11007# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
A PRELIMINARY EXPERIMENTAL INVESTIGATION OF THE RESPONSE OF A TURBOJET ENGINE TO INLET PRESSURE DISTORTION
Chen Fu-qun, Tang Di-yi, Hu Zi-long, Id Wen-lan, Yu Jin-di, Wu Xin-yuan, Zhao Jue-liang, Lin Qi-xun, Wang Zong-yuan, and Liu Si-hong *In its* Recent Selected Papers of NW Polytech. Univ., pt. 2 (FTD-ID(RS)T-0260-81-Pt-2) 28 Aug. 1981 p 317-346 refs Transl. into ENGLISH from Recent Selected Papers of NW Polytech. Univ., pt. 2 (Xian Shaanxi), 1979 (For primary document see N82-10996 01-99)
Avail: NTIS HC A18/MF A01

N82-11008# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

AN EXPERIMENTAL INVESTIGATION OF THE ROTATING STALL, SURGE AND WAKE BEHIND THE ROTOR FOR A SINGLE STAGE AXIAL COMPRESSOR

Zhang Weide, Zbang Changsheng, Liu Zhiwei, and Liu Jiafeng *In its* Recent Selected Papers of NW Polytech. Univ., pt. 2 (FTD-ID(RS)T-0260-81-Pt-2) 28 Aug. 1981 p 347-370 refs Transl. into ENGLISH from Recent Selected Papers of NW Polytech. Univ., pt. 2 (Xian Shaanxi), 1979 (For primary document see N82-10996 01-99)

Avail: NTIS HC A18/MF A01

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N82-10041*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

DETERMINATION OF AIRPLANE MODEL STRUCTURE FROM FLIGHT DATA BY USING MODIFIED STEPWISE REGRESSION

Vladislav Klein (Joint Inst. for Advancement of Flight Sciences, Hampton, Va.), James G. Batterson, and Patrick C. Murphy Oct. 1981 48 p refs

(NASA-TP-1916; L-14613) Avail: NTIS HC A03/MF A01 CSCL 01C

The linear and stepwise regressions are briefly introduced, then the problem of determining airplane model structure is addressed. The MSR was constructed to force a linear model for the aerodynamic coefficient first, then add significant nonlinear terms and delete nonsignificant terms from the model. In addition to the statistical criteria in the stepwise regression, the prediction sum of squares (PRESS) criterion and the analysis of residuals were examined for the selection of an adequate model. The procedure is used in examples with simulated and real flight data. It is shown that the MSR performs better than the ordinary stepwise regression and that the technique can also be applied to the large amplitude maneuvers. T.M.

N82-10042*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

ESTIMATION OF AIRPLANE STABILITY AND CONTROL DERIVATIVES FROM LARGE AMPLITUDE LONGITUDINAL MANEUVERS

James G. Batterson Oct. 1981 43 p refs

(NASA-TM-83185; L-14524) Avail: NTIS HC A03/MF A01 CSCL 01C

The application of a modified stepwise regression algorithm to both a complete data string and to that same data partitioned into bins as a function of angle of attack was demonstrated. Results from the large-scale maneuver agree well with results from 20 maneuvers in which small perturbation from trim at various angles of attack were induced. T.M.

N82-10043*# Lear Siegler, Inc., Santa Monica, Calif. Astronics Div.

DEVELOPMENT AND EVALUATION OF AUTOMATIC LANDING CONTROL LAWS FOR LIGHT WING LOADING STOL AIRCRAFT

B. Feinreich, O. Degani, and G. Gevaert Jul. 1981 371 p refs

(Contract NAS2-9410)

(NASA-CR-166160) Avail: NTIS HC A16/MF A01 CSCL 01C

Automatic flare and decrab control laws were developed for NASA's experimental Twin Otter. This light wing loading STOL aircraft was equipped with direct lift control (DLC) wing spoilers to enhance flight path control. Automatic landing control laws that made use of the spoilers were developed, evaluated in a simulation and the results compared with these obtained for configurations that did not use DLC. The spoilers produced a significant improvement in performance. A simulation that could be operated faster than real time in order to provide statistical landing data for a large number of landings over a wide spectrum of disturbances in a short time was constructed and used in the evaluation and refinement of control law configurations. A longitudinal control law that had been previously developed and evaluated in flight was also simulated and its performance compared with that of the control laws developed. Runway alignment control laws were also defined, evaluated, and refined to result in a final recommended configuration. Good landing performance, compatible with Category 3 operation into STOL runways, was obtained. Author

N82-10044# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany).

ACTIVE CONTROL ELEMENTS ON THE TRANSONIC WING OF THE AIRBUS A-300 (ACTTA A). AIRBUS A-300 WITH REDUCED LONGITUDINAL STABILITY (ACTTA-C) [AKTIVE STEUERELEMENTE AM TRANSSONISCHEN FLUEGEL DES AIRBUS A300 (ACTTA A). AIRBUS A300 MIT REDUZIERTER LAENGSSTABILITAET (ACTTA-C)]

H. G. Klug 1980 34 p In GERMAN Presented at 2nd Bundesministerium fuer Forschung und Technologie Statusseminar Luftfahrtforsch. und Luftfahrtechnol., Garmisch-Partenkirchen, West Germany, 8-9 Oct. 1980

Avail: NTIS HC A03/MF A01

Two projects concerned with the development and design optimization of the Airbus A-300 are reviewed. Studies related to active control are discussed. Investigations specific to gust loading and maneuver induced loading of the A-300 structure are emphasized. Results influence design criteria e.g., open or closed loop control, sensor selection, etc. Reduced longitudinal stability of the A-300 is then considered as a tradeoff in favor of weight reduction through the use of lightweight materials. Wind tunnel and other simulation tests are described.

Author (ESA)

N82-10045# European Space Agency, Paris (France).

SYSTEM IDENTIFICATION OF THE LONGITUDINAL MOTION OF THE DFVLR HFB 320 RESEARCH AIRCRAFT WITH PARTICULAR CONSIDERATION OF CONTROL SURFACE EFFECTIVENESS

Ohad Rix Apr. 1981 55 p refs Transl. into ENGLISH of "Systemidentifizierung des DFVLR-Forschungsflugzeugs HFB 320 in der Laengsbewegung mit besonderer Beruecksichtigung der Steuerflaechenwirksamkeit" Rept. DFVLR-Mitt-79-66 DFVLR, Brunswick, Jul. 1979 Original report in GERMAN previously announced as N81-13971

(ESA-TT-666; DFVLR-Mitt-79-16) Avail: NTIS HC A04/MF A01; DFVLR, Cologne DM 12

Analysis of the longitudinal motion of the DFVLR HFB-320 research aircraft by means of a maximum likelihood method is described. The control surface effectiveness of separately or simultaneously deflected DLC flaps and spoilers was determined. The flight test technique, and the influence of different mathematical models on the results obtained, are illustrated and discussed. Author (ESA)

N82-10046# European Space Agency, Paris (France).

A CONTRIBUTION TO THE STABILIZATION OF FLIGHT VEHICLE PARACHUTE SYSTEMS

Christos Saliaris and Dieter Muenscher Jun. 1981 30 p refs Transl. into ENGLISH of "Beitrag zur Stabilisierung von Flugkoerper-Fallschirm-Systemen" Rept. Mitt-80-05 DFVLR, Brunswick, Apr. 1980 Original report in GERMAN previously announced as N81-13926

(ESA-TT-679; DFVLR-Mitt-80-05) Avail: NTIS HC A03/MF A01; DFVLR, Cologne DM 8,30

The dynamic behavior of a parachute-load system moving in a plane is analyzed. A mathematical model is adopted and a system of nonlinear equations of motion is produced, which are then solved without linearization using a digital computer. Calculations are carried out using a modified guide surface parachute in order to investigate the effects of parachute size, distance between attachment point and canopy, and distance between the attachment point and the center of gravity of the load on the oscillation of the missile. Parameters influencing the variation of the pitch angle of the load with time are also studied. Increasing the canopy and moving the attachment point behind the center of gravity of the load results in better stabilization. The damping increases, i.e. the pitch angle of the load becomes

smaller and the period of oscillation decreases. If the distance between the attachment point on the load and the center of the canopy base is varied, there is scarcely any detectable change to the period of oscillation. However, the damping is influenced by a change in this distance; it has a maximum when the distance is approximately that which is customarily used. Author (ESA)

N82-10047# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Abteilung Elastomechanik und Aeroelastische Stabilitaet.

A METHOD FOR DETERMINATION OF THE AEROELASTIC BEHAVIOR OF AIRCRAFT WITH ACTIVE CONTROL SYSTEMS Ph.D. Thesis - Tech. Univ. Carolo-Wilhelmina

Raymond Freymann Feb. 1981 128 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-719)

(DFVLR-FB-81-05) Avail: NTIS HC A07/MF A01; DFVLR, Cologne DM 26.30

An analytical method for the performance of dynamic calculations on servocontrolled aircraft, based on an extended formulation of the generalized aeroelastic equations is presented. The additional parameters introduced in the extended equations of motion are determined experimentally in a ground vibration test performed on a real aircraft structure as well as with help from an experimental-analytical method for determination of the transfer functions of the hydraulic actuators. The elaborated method is shown satisfactory by comparison of measured and calculated data resulting from investigations performed on a model wing structure with a rudder driven by a hydraulic actuator.

Author (ESA)

N82-10048# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).

MULTI-VARIABLE ANALYSIS AND DESIGN TECHNIQUES

Sep. 1981 168 p refs Presented at a Lecture Series held at Ankara, 28-29 Sep. 1981, Bolkesjo, Norway, 1-2 Oct. 1981, and Delft, The Netherlands, 5-6 Oct. 1981

(AGARD-LS-117) Avail: NTIS HC A08/MF A01

The basic theories and concepts involved in the design of advanced guidance and control systems employing state-space and multi-variable design methods are explained. The main topics reviewed include: (1) analysis and synthesis techniques; (2) application of observer and estimation principles; (3) computer-aided design and analysis methods; (4) system simulation techniques; and (5) tests evaluation and validation. For individual titles, see N82-10049 through N82-10058.

N82-10049# Honeywell, Inc., Minneapolis, Minn. Systems and Research Center.

THE NEED FOR MULTIVARIABLE DESIGN AND ANALYSIS TECHNIQUES

Rhall E. Pope *In* AGARD Multi-Variable Analysis and Design Tech. Sep. 1981 10 p (For primary document see N82-10048 01-08)

Avail: NTIS HC A08/MF A01

Demand for higher accuracy, improved reliability/survivability, and more automation are placing increased emphasis on the control function for successful operation of aircraft weapon systems. Modifications to airframe designs directed at increased maneuverability and reduced weight are placing stringent on flight control systems. Fly-by-wire systems, particularly digital systems, provide the flexibility to not only accommodate, but influence airframe design modifications and led to the control configured vehicle (CCV) concept. These advances in air, vehicle design and flight control system implementation are overwhelming traditional design and analysis techniques. Stability and control design specification are inadequate in dealing with statistically unstable vehicles, multiple control loops and high dynamic coupling. Better control system design and analysis techniques are needed which address the multi-input closely coupled dynamic nature of today's and tomorrows aircraft weapon systems.

A.R.H.

N82-10050# Cambridge Univ. (England). Dept. of Engineering.

CHARACTERISTIC AND PRINCIPAL GAINS AND PHASES AND THEIR USE AS MULTIVARIABLE CONTROL DESIGN TOOLS

Alistair G. J. MacFarlane *In* AGARD Multi-Variable Analysis and Design Tech. Sep. 1981 34 p refs (For primary document see N82-10048 01-08)

Avail: NTIS HC A08/MF A01

The key to the generalization of classical frequency-response design techniques to the multivariable case lies in the development of ways of suitably extending the concepts of gain and phase. It is shown how algebraic function theory can be used to generalise Nyquist diagram and Root-Locus diagram techniques for use with systems having many inputs and outputs. This is done in such a way that the main structural features of such diagrams can be related to state-space model parameters. The shortcomings of characteristic gains and phases (used in a generalised Nyquist approach) are then noted. An alternative way of introducing amplitude and phase information, via the polar decomposition of an operator, leads to the introduction of principal gains and principal phases. Their properties are examined and, in particular, it is shown how they may be used to characterise robustness. The use of these techniques for design purposes is discussed.

A.R.H.

N82-10051# Honeywell Systems and Research Center, Minneapolis, Minn.

MULTIVARIABLE DESIGN TECHNIQUES BASED ON SINGULAR VALUE GENERALIZATIONS OF CLASSICAL CONTROL

John C. Doyle *In* AGARD Multi-Variable Analysis and Design Tech. Sep. 1981 15 p refs (For primary document see N82-10048 01-08)

Avail: NTIS HC A08/MF A01

Singular value analysis was used to generalize the fundamental feedback ideas from classical single loop control theory to multiloop systems. The classical view of measuring the benefit of feedback in terms of desensitizing the system to plant variations and disturbances is discussed. Uncertainty is shown to play a critical role in determining the way in which feedback may be used. Certain singular value plots, called sigma-plots, are introduced as natural and effective generalizations of Bode gain plots and form the basic tools for analysis of multiloop feedback systems. These tools provide reliable means for assessing the stability margins, bandwidth, and desensitizing effects of multiloop feedback systems. Examples of a two input oscillator and control of the rotors of the CH-47 helicopter are given to illustrate the use of the sigma-plots and their interpretations. A.R.H.

N82-10052# Honeywell, Inc., Minneapolis, Minn. Systems and Research Center.

LIMITATIONS ON ACHIEVABLE PERFORMANCE OF MULTIVARIABLE FEEDBACK SYSTEMS

John C. Doyle *In* AGARD Multi-Variable Analysis and Design Tech. Sep. 1981 9 p refs (For primary document see N82-10048 01-08)

Avail: NTIS HC A08/MF A01

The design tradeoffs that are the focus of classical single-loop theory were generalized to multiloop systems using singular value analysis techniques. The first tradeoff is algebraic between large loop gain for good sensitivity properties and small loop gain for stability margins. Another is the functional tradeoff improsed by the Bode gain/phase relations. These tradeoffs impose limitations on the achievable performance of any feedback design. The limitations caused by nonminimum phase zeros are also discussed. The problem of directionality in multiloop systems has no analog in single loop feedback systems is presented and analyzed.

A.R.H.

N82-10053# Honeywell, Inc., Minneapolis, Minn. Systems and Research Center.

LQG-BASED MULTIVARIABLE DESIGN: FREQUENCY DOMAIN INTERPRETATION

Gunter Stein *In* AGARD Multi-Variable Analysis and Design Tech. Sep. 1981 9 p refs (For primary document see N82-10048 01-08)

Avail: NTIS HC A08/MF A01

The use of the Linear-Quadratic-Gaussian (LQG) methodology in designing feedback compensators which meet multivarible performance, stability, and stability robustness requirements expressed as singular value conditions in the frequency domain is demonstrated. A.R.H.

N82-10054# Honeywell, Inc., Minneapolis, Minn. Systems and Research Center.

LQG MULTIVARIABLE DESIGN TOOLS

Gunter Stein and Stephen Pratt *In* AGARD Multi-Variable Analysis and Design Tech. Sep. 1981 16 p refs (For primary document see N82-10048 01-08)

Avail: NTIS HC A08/MF A01

The basic design algorithms needed for frequency domain oriented Linear-Quadratic-Gaussian feedback design are described and experimental interactive computer aided design package through which these algorithms can be effectively acessed is introduced. The algorithms and design package are illustrated with several flight control design examples for highly maneuverable aircraft. A.R.H.

N82-10055# Groningen Rijksuniversiteit (Netherlands). Mathematics Inst.

DESIGN OF HIGH INTEGRITY MULTIVARIABLE CONTROL SYSTEMS

J. C. Williams *In* AGARD Multi-Variable Analysis and Design Tech. Sep. 1981 10 p refs (For primary document see N82-10048 01-08)

Avail: NTIS HC A08/MF A01

The notions of (almost) controlled and conditionally invariant subspaces of linear systems are explained and their application to the synthesis of feedback compensators for disturbance rejection and to robust controller is outlined. The disturbance rejection and the robust controller design problems are viewed as a procedure for designing a high integrity feedback control system. A.R.H.

N82-10056# Toronto Univ. (Ontario). Systems Control Group.

A GEOMETRIC APPROACH TO MULTIVARIABLE CONTROL SYSTEM SYNTHESIS

W. Murray Wonham *In* AGARD Multi-Variable Analysis and Design Tech. Sep. 1981 21 p refs (For primary document see N82-10048 01-08)

Avail: NTIS HC A08/MF A01

Multivariable control is discussed with emphasis on Multivariable Control: fundamentals, disturbance decoupling and output stabilization, controllability subspaces, noninteracting control, and regulation and tracking in linear systems and structurally stable nonlinear regulation with step inputs. A version of the internal model principle for controlled sequential machines is included. A.R.H.

N82-10057# McGill Univ., Montreal (Quebec). Dept. of Electrical Engineering.

MULTIVARIABLES DESIGN: THE OPTIMIZATION OF APPROXIMATE INVERSES

G. Zames *In* AGARD Multi-Variable Analysis and Design Tech. Sep. 1981 6 p refs (For primary document see N82-10048 01-08)

Avail: NTIS HC A08/MF A01

A mathematical framework for the analysis of sensitivity in multi-input-multi-output linear feedback systems is proposed, based on the concepts of a multiplicative seminorm and an approximate inverse. Many of the empirical results of classical control theory pertaining to the use of lead-lag networks can be deduced in this framework as solutions to well-posed mathematical optimization problems. Moreover, new classes of optimal filters for the reduction of sensitivity are introduced. A definition of optimal sensitivity to plant uncertainty is established. The multiplicative property of seminorms is used to obtain the following principle: for any specified aposteriori accuracy, there is a maximum of apriori plant uncertainty that can be tolerated, and a minimum of identification that is required. Author

N82-10058# McGill Univ., Montreal (Quebec). Dept. of Electrical Engineering.

FEEDBACK AND MINIMAX SENSITIVITY

George Zames and Bruce A. Francis (Waterloo Univ.) *In* AGARD Multi-Variable Analysis and Design Tech. Sep. 1981 8 p refs Sponsored in part by National Science and Engineering Research Council of Canada (For primary document see N82-10048 01-08)

(Grant NSF ECS-80-12-565)

Avail: NTIS HC A08/MF A01

Feedbacks that minimize the sensitivity function of a linear, single variable feedback system represented by its frequency responses were considered. Sensitivity is measured in a weighted H (infinity) norm. The single variable cases are studied. The results are extended to unstable plants, and explicit formulas for the general situation of a finite number of RHP plant zeros or poles are provided. The Q or 'approximate-inverse' parameterization of feedbacks that maintain closed-loop stability is extended to the case of unstable plants. The H (infinity) and Wiener-Hopf approaches are compared. A.R.H.

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space).*

N82-10059*# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.

EVALUATION OF THE ACOUSTIC MEASUREMENT CAPABILITY OF THE NASA LANGLEY V/STOL WIND TUNNEL OPEN TEST SECTION WITH ACOUSTICALLY ABSORBENT CEILING AND FLOOR TREATMENTS Final Report

Mark A. Theobald May 1978 46 p refs

(Contract NAS1-14611)

(NASA-CR-165796; Rept-3820) Avail: NTIS HC A03/MF A01 CSCL 14B

The single source location used for helicopter model studies was utilized in a study to determine the distances and directions upstream of the model accurate at which measurements of the direct acoustic field could be obtained. The method used was to measure the decrease of sound pressure levels with distance from a noise source and thereby determine the Hall radius as a function of frequency and direction. Test arrangements and procedures are described. Graphs show the normalized sound pressure level versus distance curves for the glass fiber floor treatment and for the foam floor treatment. A.R.H.

N82-10060# Toronto Univ., Downsview (Ontario). Inst. for Aerospace Studies.

BEYOND THREE DECADES OF CONTINUOUS RESEARCH AT UTIAS ON SHOCK TUBES AND WAVES

I. I. Glass Jul. 1981 80 p refs Presented at the 13th Intern. Symp. on Shock Tubes and Waves, Niagara Falls, N.Y., 6-9 Jul. 1991

(UTIAS-45; CN-ISSN-0082-5247) Avail: NTIS HC A05/MF A01

Analytical and experimental research on nonstationary shock waves, rarefaction waves and contact surfaces is reviewed. Some unique facilities were used to study the properties of planar, cylindrical, and spherical shock waves and their interactions. Investigations were also performed on shock-wave structure and boundary layers in ionizing argon, water-vapor condensation in rarefaction waves, magnetogasdynamic flows, and the regions of regular and various types of Mach reflections of oblique shock waves. Explosively driven implosions were employed as drivers for projectile launchers and shock tubes, and as a means of producing industrial-type diamonds from graphite, and fusion plasmas in deuterium. The effects of sonic-boom on humans, animals, and structures formed an important part of the investigations. Shock waves in dusty gases, the viscous and vibrational structure of weak spherical blast waves in air, and oblique shock wave reflections were emphasized. J.M.S.

N82-10061*# Technology, Inc., Dayton, Ohio. Life Sciences Div.

OPERATIONS AND MAINTENANCE MANUAL FOR THE LINEAR ACCELERATOR (SLED)

10 Feb. 1981 70 p refs

(Contract NAS9-14880)

(NASA-CR-167425) Avail: NTIS HC A04/MF A01 CSCL 14B

The Linear Accelerator, a sliding chair which is pulled along a stationary platform in a horizontal axis is described. The driving force is a motor controlled by a velocity loop amplifier, and the mechanical link to the chair is a steel cable. The chair is moved in forward and reverse directions as indicated by the direction of motor rotation. The system operation is described with emphasis on the electronic control and monitoring functions. Line-by-line schematics and wire lists are included. J.M.S.

N82-10062# Committee on Science and Technology (U. S. House).
AIRPORT AND AIRWAY IMPROVEMENT ACT OF 1981, PART 1
Washington GPO 1981 56 p Rept. to accompany H. R. 2643 Presented by the Comm. on Sci. and Technol. at the 97th Congr., 1st Sess., 19 Mar. 1981
(GPO-76-241-Pt-1) Avail: US Capitol, House Document Room

A bill authorizing appropriations to the FAA in the amount of $85,000,000 for air traffic control, navigation, aviation weather, aviation medicine, and ATC computer modernization for FY-1981-1982 is presented. The Committee directs that funds be reprogrammed to permit completion of the Flight Level 290 and to expedite development of the Doppler weather radar (Nexrad). The request for a trust fund to support $19.81 million of regulatory support research and development was denied. A.R.H.

N82-10063# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
AIR-BREATHING ENGINE TEST FACILITIES REGISTER
Joachim H. Krengel, comp. Jul. 1981 122 p
(AGARD-AG-269) Avail: NTIS HC A06/MF A01

A register was compiled, aimed at comprising the test facilities relevant for research and development in NATO countries. Included are test facilities being in use or under construction at the various research organizations, industrial firms, and universities. Test facilities and their technical data are given as far as the response to a questionnaire was received or open literature was available. Test engineers will be able to find whether a test facility suiting their specific demands already exists or may be easily adapted to their purposes. T.M.

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N82-10064*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SIXTH ANNUAL FLIGHT MECHANICS/ESTIMATION THEORY SYMPOSIUM
Eugene Lefferts, ed. Oct. 1981 287 p refs Conf. held at Greenbelt, Md., 27-28 Oct. 1981
(NASA-CP-2205) Avail: NTIS HC A13/MF A01 CSCL 22A

Methods of orbital position estimation were reviewed. The problem of accuracy in orbital mechanics is discussed and various techniques in current use are presented along with suggested improvements. Of special interest is the compensation for bias in satelliteborne instruments due to attitude instabilities. Image processing and correctional techniques are reported for geodetic measurements and mapping. For individual titles, see N82-10065 through N82-10077.

N82-10065*# Computer Sciences Corp., Silver Spring, Md.
A COMPARATIVE STUDY OF THE HARRIS-PRIESTER, JACCHIA-ROBERTS, AND MSIS ATMOSPHERIC DENSITY MODELS IN THE CONTEXT OF SATELLITE ORBIT DETERMINATION **c13**
Robert E. Shanklin, Jr., Taesul Lee, M. K. Mallick, R. A. Kuseski, and J. O. Cappellari, Jr. *In* NASA. Goddard Space Flight Center Sixth Ann. Flight Mech./Estimation Theory Symp. Oct. 1981 14 p refs (For primary document see N82-10064 01-12)
(Contract NAS5-24300)
Avail: NTIS HC A13/MF A01 CSCL 03B

The comparisons are summarized. The quantities compared include Bayesian weighted least squares differential correction statistics and orbit solution consistency and accuracy. T.M.

N82-10066*# Scientific Analysts and Consultants, Inc., Rockville, Md.
A GENERAL METHOD FOR COMPUTING THE TOTAL SOLAR RADIATION FORCE ON COMPLEX SPACECRAFT STRUCTURES **c92**
F. K. Chan *In* NASA. Goddard Space Flight Center Sixth Ann. Flight Mech./Estimation Theory Symp. Oct. 1981 12 p refs (For primary document see N82-10064 01-12)
Avail: NTIS HC A13/MF A01 CSCL 03B

The method circumvents many of the existing difficulties in computational logic presently encountered in the direct analytical or numerical evaluation of the appropriate surface integral. It may be applied to complex spacecraft structures for computing the total force arising from either specular or diffuse reflection or even from non-Lambertian reflection and re-radiation. T.M.

N82-10067*# Computer Sciences Corp., Silver Spring, Md.
SOLAR RADIATION FORCE MODELING FOR TDRS ORBIT DETERMINATION **c92**
Taesul Lee, Michael J. Lucas, and Robert E. Shanklin, Jr. *In* NASA. Goddard Space Flight Center Sixth Ann. Flight Mech./Estimation Theory Symp. Oct. 1981 25 p refs (For primary document see N82-10064 01-12)
(Contract NAS5-24300)
Avail: NTIS HC A13/MF A01 CSCL 03B

The relative orbit determination accuracies resulting from several TDRS models are evaluated. These models include spherical, single-plate, and restricted two-plate models. The plate models can be adjusted in both area and reflectivity through differential correction. The restricted two-plate model has an Earth-pointing plate and a solar plate: the orientation of the solar plate is restricted to rotation about an axis perpendicular to the satellite's orbital plane. T.M.

N82-10068*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PRECISION ORBIT COMPUTATIONS FOR AN OPERATIONAL ENVIRONMENT **c13**
C. E. Doll, David F. Eggert, and Richard L. Smith *In its* Sixth Ann. Flight Mech./Estimation Theory Symp. Oct. 1981 36 p refs Prepared in cooperation with Computer Science Corp., Silver Spring, Md. (For primary document see N82-10064 01-12)
Avail: NTIS HC A13/MF A01 CSCL 22C

Taking advantage of the improvements to the Earth's gravitation field and tracking station coordinates, an orbital computational consistency of the order of 5 meters was achieved for total position differences between orbital solutions for the Seasat and GEOS-3. The main source of error in these solutions was in the mathematical models that are required to generate these results, i.e., gravitation, atmospheric drag, etc. Different Earth gravitation fields and tracking coordinates were analyzed and evaluated in obtaining these computational results. Comparisons and evaluations of the Seasat results were obtained in terms of different solution types such as the Doppler only, Laser only, Doppler and Laser, etc. Other investigation using the Seasat data were made in order to determine their effect on the computational results at this particular level of consistency. T.M.

N82-10069*# Computer Sciences Corp., Silver Spring, Md.
TECHNIQUES FOR INCREASING THE EFFICIENCY OF EARTH GRAVITY CALCULATIONS FOR PRECISION ORBIT DETERMINATION **c13**
Richard L. Smith and Anatoly S. Lyubomirsky *In* NASA. Goddard Space Flight Center Sixth Ann. Flight Mech./Estimation Theory Symp. Oct. 1981 28 p ref (For primary document see N82-10064 01-12)
(Contract NAS5-24300)
Avail: NTIS HC A13/MF A01 CSCL 22C

Two techniques were analyzed. The first is a representation using Chebyshev expansions in three-dimensional cells. The second technique employs a temporary file for storing the components of the nonspherical gravity force. Computer storage requirements and relative CPU time requirements are presented. The Chebyshev gravity representation can provide a significant reduction in CPU time in precision orbit calculations, but at the cost of a large

amount of direct-access storage space, which is required for a global model. T.M.

N82-10070*# Phoenix Corp., McLean, Va.
AN ANALYSIS OF SIMULTANEOUS SATELLITE VISIBILITY TIME SPANS FOR TWO EARTH OBSERVATION STATIONS **c15**
F. K. Chan *In* NASA. Goddard Space Flight Center Sixth Ann. Flight Mech./Estimation Theory Symp. Oct. 1981 33 p (For primary document see N82-10064 01-12)
Avail: NTIS HC A13/MF A01 CSCL 22C

The analysis covers topics such as time average population, average population times and also the percentage visibility times for a given number of satellites. These results are useful for specific communications satellite applications. Numerical results are obtained for various configurations of a ground station and a ship. T.M.

N82-10071*# Scientific Analysts and Consultants, Inc., Rockville, Md.
DISTORTION-FREE MAPPING OF VISSR IMAGERY DATA FROM GEOSYNCHRONOUS SATELLITES **c43**
F. K. Chan *In* NASA. Goddard Space Flight Center Sixth Ann. Flight Mech./Estimation Theory Symp. Oct. 1981 35 p ref (For primary document see N82-10064 01-12)
(Contracts NOAA-01-8-MO1-1864; NOAA-NA79-KA-C-00026)
Avail: NTIS HC A13/MF A01 CSCL 22A

The formulation is rigorous and includes all misalignment angles of the VISSR, the sun sensor and the instantaneous spin axis with the satellite's body axis. It also includes the effects due to the motion of the satellite's suborbital point. All the mapping equations for distortion removal were reduced to simplest forms, and all the algorithms were optimized as much as possible. An approach was then formulated for implementing these algorithms for in-line operational use. It is concluded that in-line distortion removal is possible in real-time processing of infra-red but not visible VISSR imagery data. T.M.

N82-10072*# General Electric Co., Lanham, Md. Space Div.
COMPUTATIONAL ASPECTS OF GEOMETRIC CORRECTION DATA GENERATION IN THE LANDSAT-D IMAGERY PROCESSING **c43**
I. Levine *In* NASA. Goddard Space Flight Center Sixth Ann. Flight Mech./Estimation Theory Symp. Oct. 1981 16 p ref (For primary document see N82-10064 01-12)
(Contract NAS5-25300)
Avail: NTIS HC A13/MF A01 CSCL 05B

A method is presented for systematic and geodetic correction data calculation. It is based on presentation of image distortions as a sum of nominal distortions and linear effects caused by variation of the spacecraft position and attitude variables from their nominals. The method may be used for both MSS and TM image data and it is incorporated into the processing by means of mostly offline calculations. Modeling shows that the maximal of the method are of the order of 5m at the worst point in a frame; the standard deviations of the average errors less than 8m. Author

N82-10073*# General Electric Co., Lanham, Md. Space Div.
THE MSS CONTROL POINT LOCATION ERROR FILTER FOR LANDSAT-D **c43**
I. Levine *In* NASA. Goddard Space Flight Center Sixth Ann. Flight Mech./Estimation Theory Symp. Oct. 1981 18 p refs (For primary document see N82-10064 01-12)
(Contract NAS5-25300)
Avail: NTIS HC A13/MF A01 CSCL 05B

The filter produces the maximum likelihood estimates for average values of the spacecraft position and attitude errors during a single scene. The quality of the filter performance is characterized by the maximal cross and along track residual errors for which probability distributions can be calculated analytically for a given pattern of control points. The filter with an automatic selection of the best set of estimates provides geodetic correction at 90% of pixels with residual errors less than 40 m for four or more control points and the mean squared measurement errors of the order of 20-25 m. The same accuracy can be preserved for eight or more control points and measurement errors of 30-35 m. T.M.

N82-10074*# Naval Electronic Systems Command, Washington, D. C. Electronic Special Warfare and Space Div.
SPIN-AXIS ATTITUDE ESTIMATION AND MAGNETOMETER BIAS DETERMINATION FOR THE AMPTE MISSION **c43**
R. H. Thompson, G. F. Neal, and M. D. Shuster *In* NASA. Goddard Space Flight Center Sixth Ann. Flight Mech./Estimation Theory Symp. Oct. 1981 14 p refs Prepared in cooperation with Computer Sciences Corp., Silver Spring, Md. and Business and Technological Systems, Inc., Seabrook, Md. (For primary document see N82-10064 01-12)
Avail: NTIS HC A13/MF A01 CSCL 08B

Algorithms were developed for magnetometer biases and spin axis attitude calculation. Numerical examples of the performance of the algorithm are given. T.M.

N82-10075*# Computer Sciences Corp., Silver Spring, Md.
A MATHEMATICAL MODEL OF LANDSAT-D ATTITUDE DYNAMICS WITH INTERNAL MOTION **c15**
S. D. Oh, G. W. Abshire, and J. M. Buckley *In* NASA. Goddard Space Flight Center Sixth Ann. Flight Mech./Estimation Theory Symp. Oct. 1981 20 p refs (For primary document see N82-10064 01-12)
Avail: NTIS HC A13/MF A01 CSCL 22A

An algorithm to model the effects of intenal motion by the solar array and the high gain antenna on the attitude of the LANDSAT-D spacecraft is presented. The relative torque and angular momenta arising from the internal motions are assumed to be attitude independent but are considered to be a source of attitude perturbations. The equation of motion for the three body problem is derived and then compared with the one body case. The effect of the internal motion on the control of the spacecraft is shown in a computer study of the problem. T.M.

N82-10076*# General Electric Co., Philadelphia, Pa. Control Systems Engineering Dept.
SPACECRAFT ATTITUDE POINTING PERFORMANCE DURING ORBIT ADJUST AS A FUNCTION OF COMPENSATOR ORDER **c15**
S. Basuthakur, R. Duelfer, A. Peckjian, and T. Stick *In* NASA. Goddard Space Flight Center Sixth Ann. Flight Mech./Estimation Theory Symp. Oct. 1981 4 p (For primary document see N82-10064 01-12)
Avail: NTIS HC A13/MF A01 CSCL 22A

A steady state compensator of specified order is proposed to estimate the required duty cycle needed to balance the distribution torque. The compensator was increased gradually to demonstrate the improvement in pointing accuracy. The basic mathematical model of the flexible spacecraft and sensor used to characterize the performance of the compensator are described. T.M.

N82-10077*# Business and Technological Systems, Inc., Seabrook, Md. Research and Development Div.
EFFICIENT ALGORITHMS FOR SINGLE-AXIS ATTITUDE ESTIMATION **c13**
M. D. Shuster *In* NASA. Goddard Space Flight Center Sixth Ann. Flight Mech./Estimation Theory Symp. Oct. 1981 25 p refs (For primary document see N82-10064 01-12)
Avail: NTIS HC A13/MF A01 CSCL 22A

The computationally efficient algorithms determine attitude from the measurement of art lengths and dihedral angles. The dependence of these algorithms on the solution of trigonometric equations was reduced. Both single time and batch estimators are presented along with the covariance analysis of each algorithm. T.M.

N82-10078*# Rockwell International Corp., Downey, Calif. Space Div.
SPAR 8 EXPERIMENT REPORT CONTAINERLESS PROCESSING OF GLASS EXPERIENT 74-42
R. A. Happe and K. S. Kim 24 Sep. 1981 37 p refs (Contract NAS8-32023)
(NASA-CR-161872; SSD-81-0165) Avail: NTIS HC A03/MF A01 CSCL 22A

The flight experiment was designed to produce a single 0.64 cm (1/4 inch) diameter SPAR 8 silica modified gallia calcia glass (39.3 GA2O2: 35.7 CaO: 25.0 SiO2 in mol percent)

containerless melted and cooled in a single axis acoustic levitator. Because the acoustic levitator suspended a sample of the same composition sample for only 27 seconds of the desired 240 seconds during SPAR 6, the sonic positioning time was increased for SPAR 8 to encompass the entire processing cycle. As a result of parachute malfunction, the SPAR 8 payload impacted the ground at a speed of approximately 300 ft/sec (about 200 MPH) and the experiment package suffered severe damage. The flight experiment sample is not yet recovered. The flight motion picture film, however, was recovered and successfully developed. The analysis of the motion picture showed that the experiment hardware functioned in most regards as planned, except the acoustic levitator, which suspended the sample for only 82 seconds of the desired 240 seconds. A.R.H.

N82-10079*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
MSFC EVALUATION OF THE SPACE FABRICATION DEMONSTRATION SYSTEM (BEAM BUILDER)
E. O. Adams and C. N. Irvine Sep. 1981 52 p ref
(Contract NAS8-32472)
(NASA-TM-82440) Avail: NTIS HC A04/MF A01 CSCL 22A

The beam builder, designed and manufactured as a ground demonstration model, is a precursor to a machine for use in the space environment, transportable by the space shuttle. The beam builder has the capability to automatically fabricate triangular truss beams in low Earth orbit with a highly reliable machine that requires a minimum of in-space maintenance and repair. A performance assessment of the beam builder, which was fabricated from commercial hardware is given. J.M.S.

N82-10080*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
MATERIALS PROCESSING IN SPACE PROGRAMS TASKS
E. Pentecost 1981 150 p refs
(NASA-TM-82443) Avail: NTIS HC A07/MF A01 CSCL 22A

Active research tasks as of the end of fiscal year 1981 of the materials processing in space program, NASA Office of Space and Terrestrial Applications are summarized to provide an overview of the program scope for managers and scientists in industry, university, and government communities. The program, its history, strategy, and overall goal are described the organizational structures and people involved are identified and a list of recent publications is given for each research task. Four categories: Crystal Growth; Solidification of Metals, Alloys, and Composites; Fluids, Transports, and Chemical Processes, and Ultrahigh Vacuum and Containerless Processing Technologies are used to group the tasks. Some tasks are placed in more than one category to insure complete coverage of each category. A.R.H.

N82-10081# Research Inst. of National Defence, Linkoeping (Sweden). Huvudavdelning 3.
THE SALYUT 6 SPACECRAFT DURING THE PERIOD 19 AUGUST 1979 TO 30 JUNE 1980 [RYMDSTATIONEN 'SALJUT-6' UNDER TIDEN 19 AUGUSTI 1979 - 30 JUNI 1980]
Astrid Rundkwist Nov. 1980 46 p refs In SWEDISH
(FOA-C-30206-F4) Avail: NTIS HC A03/MF A01

Unmanned orbits plus 185 days of manned flight are described. The scientific experiments are mentioned, including work with the small spectrograph, investigations to determine the influence of reduced gravity on production of interferon and tests with two furnaces for the production of crystals and alloys. Author (ESA)

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

N82-10082# Toronto Univ., Downsview (Ontario). Inst. for Aerospace Studies.
APPLICATION OF THE EXTENDED KALMAN FILTER TO SEVERAL FORMULATIONS OF ORBIT DETERMINATION
Paul Chodas Aug. 1981 103 p refs Sponsored by the Communications Research Center
(UTIAS-TN-224; ISSN-0082-5263) Avail: NTIS HC A06/MF A01

Various sets of orbital elements are considered as state variables, and particular attention is given to two sets based on velocity space concepts. The properties of these sets are examined in detail and compared in the orbit determination context. Successful orbit determination is demonstrated using both of these sets, as well as the conventional set of position and velocity components. Although the velocity-space sets perform acceptably well, the conventional set is somewhat better in the cases studied. However, the conventional set is shown to be susceptible to an initial transient causing divergence. A simple technique is shown to alleviate the problem. Various sets of observables are applied to the determination of low Earth orbits, and, with typical amounts of measurement noise, the best set is shown to be azimuth, elevation, and range. Finally, the use of measurements from multiple sites is shown to significantly improve the orbit determination accuracy. J.M.S.

N82-10083# Engins Matra, Velizy (France).
ANALYSIS OF THE FREE MOTION OF SATELLITES UNDER THE EFFECT OF THE TERRESTRIAL GRAVITATIONAL POTENTIAL [ANALYSE DU MOUVEMENT LIBRE DES SATELLITES SOUS L'EFFET DU POTENTIAL DE GRAVITATION TERRESTRE]
S. Grodner and J. M. Pairot 26 Jun. 1980 54 p refs In FRENCH
Avail: NTIS HC A05/MF A01

The effect of one type of perturbation on the motion of the center of gravity of a satellite is studied, theoretically. The free motion, i.e., without trajectory correction, of a spacecraft, given its position and initial velocity, is determined by considering only the influence of the Earth's gravity. The gravitational potential created by a planet at a point in outer space is expressed. Lagrange perturbation formulas are introduced. The principal behind the approximations made in the analytical solution of the Lagrange perturbation system is explained. Implications of various terms used are considered. Author (ESA)

N82-10084# Engins Matra, Velizy (France).
SOLAR PERTURBATION FORCES: ESTIMATION AND COMPENSATION. ERROR CURVES FOR YAW AND FUEL CONSUMPTION [ESTIMATION ET COMPENSATION DES COUPLES PERTURBATEURS SOLAIRES ABAQUES D'ERREUR-LACET ET DE CONSUMMATION]
Roland Oskian and Jean Broquet 1980 67 p In FRENCH
Avail: NTIS HC A04/MF A01

Solar radiation pressure as a destabilizing force on a satellite in the operational mode is considered. Torque on the satellite due to this force is evaluated and its compensation is studied. In estimating the torque, the only data used, besides the satellite characteristics, are values for the transverse kinetic moment and, as a consequence, the instants of thruster impulses as well as their direction. Knowing the perturbation torque makes it possible to calculate, in conjunction with the error curves presented, yaw error along with satellite propellant consumption. Author (ESA)

N82-10065*# Computer Sciences Corp., Silver Spring, Md.
A COMPARATIVE STUDY OF THE HARRIS-PRIESTER, JACCHIA-ROBERTS, AND MSIS ATMOSPHERIC DENSITY MODELS IN THE CONTEXT OF SATELLITE ORBIT DETERMINATION
Robert E. Shanklin, Jr., Taesul Lee, M. K. Mallick, R. A. Kuseski, and J. O. Cappellari, Jr. *In* NASA. Goddard Space Flight Center Sixth Ann. Flight Mech./Estimation Theory Symp. Oct. 1981 14 p refs (For primary document see N82-10064 01-12)
(Contract NAS5-24300)
Avail: NTIS HC A13/MF A01 CSCL 03B

N82-10068*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PRECISION ORBIT COMPUTATIONS FOR AN OPERATIONAL ENVIRONMENT
C. E. Doll, David F. Eggert, and Richard L. Smith *In its* Sixth Ann. Flight Mech./Estimation Theory Symp. Oct. 1981 36 p refs Prepared in cooperation with Computer Science Corp., Silver

Spring, Md. (For primary document see N82-10064 01-12)
Avail: NTIS HC A13/MF A01 CSCL 22C

N82-10069*# Computer Sciences Corp., Silver Spring, Md.
TECHNIQUES FOR INCREASING THE EFFICIENCY OF EARTH GRAVITY CALCULATIONS FOR PRECISION ORBIT DETERMINATION
Richard L. Smith and Anatoly S. Lyubomirsky *In* NASA. Goddard Space Flight Center Sixth Ann. Flight Mech./Estimation Theory Symp. Oct. 1981 28 p ref (For primary document see N82-10064 01-12)
(Contract NAS5-24300)
Avail: NTIS HC A13/MF A01 CSCL 22C

N82-10077*# Business and Technological Systems, Inc., Seabrook, Md. Research and Development Div.
EFFICIENT ALGORITHMS FOR SINGLE-AXIS ATTITUDE ESTIMATION
M. D. Shuster *In* NASA. Goddard Space Flight Center Sixth Ann. Flight Mech./Estimation Theory Symp. Oct. 1981 25 p refs (For primary document see N82-10064 01-12)
Avail: NTIS HC A13/MF A01 CSCL 22A

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air)*.

N82-10085# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
RANGE INSTRUMENTATION: THE WHITE SANDS MISSILE RANGE DATA SYSTEMS MANUAL
L. R. Sugerman (New Mexico State Univ., Las Cruces) Aug. 1981 10 p
(AGARD-AR-168; ISBN-92-835-1395-9) Avail: NTIS HC A02/MF A01

The manual contains data on the telemetry systems, drone formation control system, optical instrumentation systems, and optical data reduction. Techniques of statistical analysis, least squares, and coordinate systems and map projections were reviewed. The radar systems, and the meterological and timing systems were examined. The data products were analyzed. T.M.

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N82-10086* RCA Astro-Electronics Div., Princeton, N. J. Dynamics Explorer Program Office.
DYNAMICS EXPLORER: INTERFACE DEFINITION STUDY, VOLUME 2 Final Report
20 Oct. 1978 401 p refs 2 Vol.
(Contract NAS5-25020)
(NASA-CR-166625; AE-R-4270-Vol-2) Avail: NTIS CSCL 22B

Design and analysis tasks are identified for the attitude control subsystem, the structural design, and the command and data handling subsystem of the Dynamics Explorer Satellites. Mechanical drawings and reliablity predictions are included.
J.M.S.

N82-10087*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
REPORT ON ACTIVE AND PLANNED SPACECRAFT AND EXPERIMENTS
Robert W. Vostreys, ed. and Harriet H. Maitson, ed. Aug. 1981 310 p refs
(NASA-TM-84025; NSSDC/WDC-A-R&S-81-10) Avail: NTIS HC A14/MF A01 CSCL 22A

Active and planned spacecraft activity and experiments between June 1, 1980 and May 31, 1981 known to the National Space Science Data Center are described. The information covers a wide range of disciplines: astronomy, Earth sciences, meteorology, planetary sciences, aeronomy, particles and fields, solar physics, life sciences, and material sciences. Each spacecraft and experiment is described and its current status presented. Descriptions of navigational and communications satellites and of spacecraft that contain only continuous radio beacons used for ionospheric studies are specifically excluded. J.D.H.

N82-10088*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SPACE PROCESSING APPLICATIONS ROCKET PROJECT (SPAR 6) Final Report
R. Chassay, comp. Oct. 1981 290 p refs
(Proj. SPAR)
(NASA-TM-82433) Avail: NTIS HC A13/MF A01 CSCL 22B

Experiments on the containerless processing of materials in space performed on the flight of the SPAR 6 sounding rocket are described. For individual titles, see N82-10089 through N82-10092.

N82-10089*# Rockwell International Corp., Thousand Oaks, Calif. Satellite Systems Div.
CONTAINERLESS PROCESSING OF GLASS Technical Report, 1 Mar. 1980
Ralph A. Happe *In* NASA. Marshal Space Flight Center Space Process. Appl. Rocket Proj. (SPAR) 6 Oct. 1981 54 p refs (For primary document see N82-10088 01-15)
(Contract NAS8-32023)
(SSD-80-0045) Avail: NTIS HC A13/MF A01 CSCL 22B

Ground-based research on the containerless melting of glass and experiments performed during a flight on the SPAR 6 are described. Experiments leading to selection of the flight sample composition, a silica-modified gallia/calcia glass, and the preparation of a one quarter inch diameter flight sample are described. During the flight experiment, a sample of the glass was containerless melted and cooled to a clear glass in a single axis acoustic positioning apparatus. The functioning of the flight experimental hardware was evaluated. The evaluation of the sample is presented. J.D.H.

N82-10090*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
EPITAXIAL GROWTH OF SINGLE CRYSTAL FILMS Final Report, 4 Oct. 1975 - 31 May 1980
M. D. Lind, R. L. Kroes, and A. A. Immorlica, Jr. *In its* Space Process. Appl. Rocket Proj. (SPAR) 6 Oct. 1981 41 p refs Prepared in cooperaion with Rockwell International Corp., Thousand Oaks, Calif. (For primary document see N82-10088 01-15)
(Contract NAS8-31738)
(ERC4 1001.30FR) Avail: NTIS HC A13/MF A01 CSCL 22B

An experiment in gallium arsenide liquid phase epitaxy (LPE) on a flight of the SPAR 6 is described. A general purpose LPE processor suitable for either SPAR or Space Transportation System flights was designed and built. The process was started before the launch, and only the final step, in which the epitaxial film is grown, was performed during the flight. The experiment achieved its objectives; epitaxial films of reasonably good quality and very nearly the thickness predicted for convection free diffusion limited growth were produced. The films were examined by conventional analytical techniques and compared with films grown in normal gravity. J.D.H.

N82-10091*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
CONTAINERLESS PROCESSING TECHNOLOGY EXPERIMENT REPORT Technical Report, May 1981
T. G. Wang, D. D. Elleman, N. Jacobi, and A. P Croonquist *In* NASA. Marshall Space Flight Center Space Process. Appl. Rocket Proj. (SPAR) 6 Oct. 1981 104 p refs (For primary document see N82-10088 01-15)

(Contract NAS7-100)
Avail: NTIS HC A13/MF A01 CSCL 22B

The stability and manipulability of liquid drops at zero gravity are investigated. The center of mass motion in an acoustic chamber, the rotation capability of the chamber, the natural resonant frequencies and damping mechanism of drop oscillation, and the drop shape change due to rotation were investigated. The apparatus used on the SPAR 6, and the theoretical background for the experiment are described. The data obtained from free and forced oscillation, from combined oscillation and rotation, during the relaxation of the drop, and as a rotating drop is spun up from rest are analyzed. The computer data translation program developed for the image processing and computerized simulations of the analysis of similar data are described. J.D.H.

N82-10092*# Grumman Aerospace Corp., Bethpage, N.Y.
DIRECTIONAL SOLIDIFICATION OF MAGNETIC COMPOSITES Technical Report, Jul. 1980
Ron G. Pirich and David J. Larson, Jr. *In* NASA. Marshall Space Flight Center Space Process. Appl. Rocket Proj. (SPAR) 6 Oct. 1981 61 p refs (For primary document see N82-10088 01-15)
(Contract NAS8-32219)
Avail: NTIS HC A13/MF A01 CSCL 22B

The directional solidification of three samples of eutectic Bi/MnBi during a low-g interval aboard the SPAR 6 flight is compared with solidification of comparison samples in a 1 g environment under identical furnace velocity and thermal conditions. Plane front directional solidification eutectic Bi/MnBi composites prepared at 1 g over a range of growth velocities, thermal gradients, and solidification orientations with respect to the gravity vector are compared with the samples prepared in space. Morphological analyses and the magnetic properties of the flight samples are compared with the samples obtained at 1 g. J.D.H.

N82-10093*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A STUDY OF THE LONGEVITY AND OPERATIONAL RELIABILITY OF GODDARD SPACECRAFT, 1960-1980
Edward F. Shockey Aug. 1981 50 p
(NASA-TM-82178) Avail: NTIS HC A03/MF A01 CSCL 22B

Compiled data regarding the design lives and lifetimes actually achieved by 104 orbiting satellites launched by the Goddard Spaceflight Center between the years 1960 and 1980 is analyzed. Historical trends over the entire 21 year period are reviewed, and the more recent data is subjected to an examination of several key parameters. An empirical reliability function is derived, and compared with various mathematical models. Data from related studies is also discussed. The results provide insight into the reliability history of Goddard spacecraft an guidance for estimating the reliability of future programs. Author

N82-10094*# RCA Astro-Electronics Div., Princeton, N. J. Dynanics Explorer Program Office.
DYNAMICS EXPLORER: INTERFACE DEFINITION STUDY, VOLUME 1 Final Report
20 Oct. 1978 419 p refs
(Contract NAS5-25020)
(NASA-CR-166742; AE-R-4270-Vol-1) Avail: NTIS HC A18/MF A01 CSCL 22B

Work done in response to the work statement wherein a specific deliverable was not identified but where design and analysis tasks were identified is reported. The summary and baseline change list is included along with design notes for the spacecraft system, thermal subsystem, power subsystem, communications subsystem, plasma wave instrument interface definition, and the structure. A.R.H.

N82-10095# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Reihe Flugtechnik.
POSITIONING MOTORS AND MOTIVE POWER SUPPLIES FOR THRUST RUDDERS ON GUIDED MISSILES [STELLMOTORE UND ENERGIEVERSORGUNG FUER RUDERANTRIEBE BEI FLUGKOERPERN]
F. Hofmann 21 May 1980 50 p refs In GERMAN
(MBB-UA-536/80-OE) Avail: NTIS HC A03/MF A01

The application of thrust rudders on guided missiles is considered. For specific configurations, performance criteria are determined and discussed. Examples of thrust rudder systems are illustrated, and schemes for optimizing their design are assessed. Propulsion systems commonly used with thrust rudders are also briefly reviewed. Author (ESA)

N82-10096# Research Inst. of National Defence, Stockholm (Sweden). Huvudavdelning 2.
STABILITY MEASUREMENT AND FREE FLIGHT MOTION OF PROJECTILES WITH DIFFERENT BOATTAIL GEOMETRIES [STABILITETSMAETNING OCH SPRIDNINGSSKJUNTNING AV PROJEKTILER MED OLIKA PLACERING AV GOERDELN MALFOM 4.4831 ETAPP 5]
Sven Nordstroem Nov. 1980 62 p refs In SWEDISH; ENGLISH summary
(FOA-C-20379-D2) Avail: NTIS HC A04/MF A01

Tests on 7.5 cm projectiles with three different locations of the rotating bands were carried out. Stability measurements at four different velocities were performed as well as dispersion measurements for long-range firing at two velocities. The location of the rotating band affects neither the aeroballistic values nor the range/dispersion to any appreciable extent, except when firing at subsonic velocity, where the dynamic moment coefficients and the dynamic stability factor change considerably. At projectile velocities well above M = 1.0 a change of the position of the rotating band within the tested interval of 0.07 caliber to 0.87 caliber in front of the conical boattail does not affect the aeroballistic behavior of the projectile to any appreciable extent. Author (ESA)

N82-10097# Engins Matra, Velizy (France).
IN-FLIGHT THERMIC PROBLEMS ENCOUNTERED WITH A BALLISTIC MISSILE: GENERAL STUDY [PROBLEMES THERMIQUES RENCONTRES PAR UN MISSILE BALISTIQUE SUR SA TRAJECTOIRE ETUDE A CARACTERE GENERAL]
M. Lemonnier 14 Dec. 1979 100 p In FRENCH
(N-FIT-768) Avail: NTIS HC A05/MF A01

A calculation method that gives the temperature distribution within a body placed in a flow and following a trajectory, corresponding to the flight conditions of a missile, is defined. The method is to be incorporated in a minicomputer program. Heat transmission across the flow boundary layer, and then by conduction through a body composed of a succession of mediums whose thermic characteristics differ, was studied, supposing that the heat flow is monodimensional. Results are used to elaborate calculation schemes, and a program is established. An application of the program is recounted. Author (ESA)

N82-10098# British Aerospace Dynamics Group, Bristol (England).
STUDY OF NOISE FILTERING AND CONTROL OF POINTING SYSTEMS Final Report
Paris ESA Dec. 1980 452 p refs
(Contract ESTEC-3448/77/NL-AK(SC))
(ESS/SS-1023; ESA-CR(P)-1435) Avail: NTIS HC A20/MF A01

Baseline definitions and sensor characteristics are surveyed for optical inertial and RF sensors. Actuator and system dynamics are described taking into account necessary baseline definitions and sensor characteristics and then considered for a momentum biased system. Dynamic equations are derived and explained in order to present the theory behind the pointing characteristics of a fixed momentum wheel for a geostationary satellite with noise free sensors and actuators. The design of an attitude control system based on a third-order observed for the Inertial Scientific Mission (ISM) noise free situation is presented with results of assessment by digital simulation and analytic methods which verify design. The performance of an orbiter based pointing system modelled on the common attitude pointing system (CAPS) is analyzed, using the simulation results. ISM and CAPS are then considered in the presence of noise. Analysis is carried out, using the convariance analysis descriptive function technique method. Author (ESA)

N82-10099# European Space Agency, Paris (France).
POMS: POLAR ORBITING METEOROLOGICAL SATELLITE

J. Puls, P. Meischner, R. Naehle, M. Piening, A. Pietrass, B. Schmidt, H. P. Schmidt, and R. Stapf Jun. 1981 163 p refs Transl. into ENGLISH of "POMS, Polarer Meteorologischer Satellite", Rept. DFVLR-FB-7937 DFVLR, Oberpfaffenhofen, West Germany, May 1979 Original report in GERMAN previously announced as N81-13984
(ESA-TT-671; DFVLR-FB-79-37) Avail: NTIS HC A08/MF A01; DFVLR, Cologne DM 26,80

A conceptual study for a climate research mission specially prepared for Earth radiation budget measurements was performed. The requisite daily global coverage is fulfilled by a system of three orbiting satellites. One of these is on a non-Sun synchronous drift orbit with an inclination of approximately 57 deg represented by the ESA satellite SEOCS. The other two are polar orbiting satellites, designated POMS. Appropriate near polar orbits are designed for these and concepts are investigated up to component level in order to demonstrate mission feasibility. Subsystem descriptions for thermal control energy supply, attitude stabilization, telecommunications and data processing are given. Cost estimates are provided. Author (ESA)

N82-10100# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Hochfrequenztechnik.
PROPOSAL FOR A GROUND STATION ANTENNA FOR GEOSTATIONARY SATELLITES WITH A SIMPLE CONCEPT OF BEAM STEERING
Peter Sliwinski and Hans-Juergen Steiner Nov. 1980 68 p refs Report will also be announced as translation (ESA-TT-717) In GERMAN; ENGLISH summary
(DFVLR-Mitt-81-05) Avail: NTIS HC A04/MF A01; DFVLR, Cologne DM 14,40

A center fed Cassegrain system with a conical corrugated horn and doubly curved reflectors is proposed. The beam shaping has the purposes: reduction of interference with neighboring satellites and beam steering in one direction, e.g., azimuth direction. The beam steering is realized by lateral displacement of the subreflector. The effects of feed displacement are investigated by analytical methods. The radiation patterns at 11 GHz for focused and defocused antenna systems were calculated. Results show 50.5 dBi, half power beam width 0.30 deg and 0.92 deg; in this angle range the cross polarization is greater than 40 dB. Author (ESA)

N82-10070*# Phoenix Corp., McLean, Va.
AN ANALYSIS OF SIMULTANEOUS SATELLITE VISIBILITY TIME SPANS FOR TWO EARTH OBSERVATION STATIONS
F. K. Chan *In* NASA. Goddard Space Flight Center Sixth Ann. Flight Mech./Estimation Theory Symp. Oct. 1981 33 p (For primary document see N82-10064 01-12)
Avail: NTIS HC A13/MF A01 CSCL 22C

N82-10075*# Computer Sciences Corp., Silver Spring, Md.
A MATHEMATICAL MODEL OF LANDSAT-D ATTITUDE DYNAMICS WITH INTERNAL MOTION
S. D. Oh, G. W. Abshire, and J. M. Buckley *In* NASA. Goddard Space Flight Center Sixth Ann. Flight Mech./Estimation Theory Symp. Oct. 1981 20 p refs (For primary document see N82-10064 01-12)
Avail: NTIS HC A13/MF A01 CSCL 22A

N82-10076*# General Electric Co., Philadelphia, Pa. Control Systems Engineering Dept.
SPACECRAFT ATTITUDE POINTING PERFORMANCE DURING ORBIT ADJUST AS A FUNCTION OF COMPENSATOR ORDER
S. Basuthakur, R. Duelfer, A. Peckjian, and T. Stick *In* NASA. Goddard Space Flight Center Sixth Ann. Flight Mech./Estimation Theory Symp. Oct. 1981 4 p (For primary document see N82-10064 01-12)
Avail: NTIS HC A13/MF A01 CSCL 22A

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

N82-10101*# General Electric Co., Philadelphia, Pa. Reentry Systems Div.
PARAMETER ANALYTICAL STUDIES FOR THE NONLINEAR DYNAMIC RESPONSE OF THE TILE/PAD SPACE SHUTTLE THERMAL PROTECTION SYSTEM
Harold Edighoffer 28 Oct. 1981 71 p refs
(Contract NAS1-16121)
(NASA-CR-165707) Avail: NTIS HC A04/MF A01 CSCL 22B

The studies examined for imposed sinusoidal and random motions of the shuttle skin and/or applied tile pressure. Studies are performed using the computer code DYNOTA which takes into account the highly nonlinear stiffening hysteresis and viscous behavior of the pad joining the tile to the shuttle skin. Where available, experimental data are used to confirm the validity of the analysis. Both analytical and experimental studies reveal that the system resonant frequency is very high for low amplitude oscillations but decreases rapidly to a minimum value with increasing amplitude. T.M.

N82-10102*# National Aeronautics and Space Administration, Washington, D. C.
MISSION OPERATION REPORT: OSTA-1
26 Oct. 1981 28 p
(NASA-TM-84053; S-420-81-01) Avail: NTIS HC A03/MF A01 CSCL 22B

The Office of Space and Terrestrial Applications (OSTA 1) payload was designed to demonstrate shuttle's capability as a space research platform and the potential application of techniques for future remote sensing. Because thermal tests planned for STS-2 flight require that the payload bay to be pointed towards Earth, the experiments selected for OSTA 1 emphasize terrestrial sciences and are concerned with remote sensing for Earth resources, environmental quality, ocean conditions, meteorological phenomena, and life sciences. Characteristics of the STS-2 flight, the major events timeline, geopgraphical areas coverage, pallet experiments ground coverages, and experiment operating modes are described. The OSTA-1 pallet configuration, payload interface, and the instruments comprising each of the experiments are described and illustrated. Mission support stations, and the payload team are listed. Mission cost data are included. A.R.H.

N82-10103*# National Aeronautics and Space Administration, Washington, D. C.
MISSION OPERATION REPORT: SPACE SHUTTLE PROGRAM, STS-2 LAUNCH
22 Oct. 1981 28 p
(NASA-TM-84054; M-989-81-02) Avail: NTIS HC A03/MF A01 CSCL 22A

The capability for routine prelaunch, launch, orbital, entry, approach, landing, and turnaround operations for the orbital flight test phase of the Space Shuttle program is discussed. The mission objectives as well as a detailed description of the STS-2 mission are given. B.W.

N82-10104# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Advanced Programs and Technology Dept.
FUTURE SPACE TRANSPORTATION SYSTEMS FOR EUROPE. VOLUME 1: SUMMARY STUDY REPORT
Paris ESA Oct. 1980 63 p
(Contract ESA-4268/80/F-DD(SC))
(MBB-URV-119/80-Vol-1; ESA-CR(P)-1441-Vol-1) Avail: NTIS HC A04/MF A01

Launch vehicle alternatives for Europe after Ariane 4 are defined based on expected mission and payload requirements for the period after 1990. The alternatives are : (1) a clustered vehicle with Ariane 4 components, (2) the expendable vehicle Ariane 5, (3) an Ariane with reusable second stage, (4) a (new) expendable cryogenic launch vehicle and (5) a fully reusable

vehicle. All in the low Earth orbit payload range of 10 to 16 Mg. For geostationary communication satellites (2.5 to 4.5 Mg), a separate analysis of the possible transfer and injection system was made, including a cost and cost effectiveness analysis. The economics and programs analysis with comparison of U.S. and other launch capabilities in the 1990's indicate that only a fully reusable launch vehicle can fulfil all the mission and payload requirements. Author (ESA)

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications*.

N82-10105# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
STAR PATTERN RECOGNITION AND SPACECRAFT ATTITUDE DETERMINATION
Thomas E. Strikwerda and John L. Junkins Fort Belvoir, Va. Corps of Engineers May 1981 198 p refs
(Contract DAAK70-78-C-0038)
(AD-A103806; ETL-0260) Avail: NTIS HC A09/MF A01 CSCL 17/7

A method for real-time on-board spacecraft attitude determination is presented. The method is suitable for processing CCD or CID stellar camera and rate gyro output to determine orientation to better than five arc seconds. The system is self-calibrating; uncertain parameters such as interlock angles and gyro biases can be included in the estimation algorithms. The system is implemented in a microcomputer system which conclusively establishes that the system is compatible with on-board computation constraints. Author (GRA)

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support*. For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics*.

N82-10106*# National Aeronautics and Space Administration. Pasadena Office, Calif.
RADIATIVE COOLER Patent Application
Stanley W. Petrick (JPL, California Inst. of Tech., Pasadena) and Ramon D. Garcia, inventors (to NASA) (JPL, California Inst. of Tech., Pasadena) Filed 17 Jul. 1981 13 p
(Contract NAS7-100)
(NASA-Case-NPO-15465-1; US-Patent-Appl-SN-284289) Avail: NTIS HC A02/MF A01 CSCL 22B

A device for use in passively cooling spaces, applicable to any level of thermal radiation in vacuum and to high-intensity thermal radiation in non-vacuum environments, is described. The device includes an enclosure nested in a multiplicity of thin, low-emittance, highly-reflective shields suspended in a casing in mutual angular relation and having V-shaped spaces for redirecting thermal radiation entering the sides of the shields. Successively reduced quantities of thermal radiation are reflected by the surfaces along substantially parallel paths extended through the V-shaped spaces to a common heat sink such as the cold thermal background of space. T.M.

N82-10107# European Space Agency, Paris (France).
FLIGHT TEST RESULTS OF THE MODEL SIMULATION CONTROLLER FOR THE HFB 320 FOR IN-FLIGHT SIMULATION OF THE A310 AIRBUS
Hans-Heinz Lange Apr. 1981 72 p refs Transl. into ENGLISH of 'Flugerprobung des modellfolgereglers fuer die HFB 320 zur Simulation des Airbus A 310 in Fluge" Rept. DFVLR-Mitt-79-13 DFVLR, Brunswick, 1979 Original report in GERMAN previously announced as N81-10078
(ESA-TT-660; DFVLR-Mitt-79-13) Avail: NTIS HC A04/MF A01; DFVLR, Cologne DM 15,40

The onboard computer program which completes the model simulating control system is presented and its fundamental operations explained. The effect of nonlinearities is demonstrated by means of the results of ground simulation of the test aircraft, the control system and the simulated aircraft. The flight test results show the achieved quality of in-flight simulation of the modeled A310 aircraft. Examples of the ground simulation predictions of the overall aircraft and controller system behavior are cited. Author (ESA)

N82-10108# European Space Agency, Paris (France).
SYNTHESIS OF WORK CONCERNING EDDY CURRENT PENDULAR NUTATION DAMPER. APPLICATION TO THE RATING AND CHECKING OF A ROTATING SIMULATOR
J. Castro, J. J. Runavot, and L. Torres Jun. 1981 22 p refs Transl. into ENGLISH of 'Synthese des Travaux Effectues sur les Amortisseurs Pendulaires a Courants de Foucault. Application a la Qualification et Verification d'un Simulateur Tournant", Rept. CNES-78/CT/PRT/SST/SS, CNES, Toulouse, 12 Jul. 1978 Original report in FRENCH previously announced as N81-20169
(ESA-TT-695; CNES-78/CT/PRT/SST/SS/197) Avail: NTIS HC A02/MF A01

Eddy current nutation dampers for spin stabilized spacecraft are presented. The performance and the characteristic parameters of this pendular nutation damper are estimated and compared with the Mercury nutation damper developed for the Meteosat Project. A theoretical model of the motion damping is explained. Results lead to the design of an experiment which measures intrinsic damping parameters, given the design of the elastic suspension of the damper. The test was carried out on an air bearing simulator. Attainable precision demonstrated during this test indicates that the test rig is suitable for application in the certification of various satellite spin stabilization systems.
Author (ESA)

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography*.

No abstracts in this category.

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels*, and *44 Energy Production and Conversion*.

N82-10109*# Aerojet Liquid Rocket Co., Sacramento, Calif.
DESIGN, FABRICATION, TEST, AND DELIVERY OF A HIGH-PRESSURE OXYGEN/RP-1 INJECTOR Final Report
L. Schoenman and R. S. Gross 30 Sep. 1981 100 p refs
(Contract NAS8-33651)
(NASA-CR-161877; Rept-33651F) Avail. NTIS HC A05/MF A01 CSCL 21H

A summary of the design analyses for a liquid rocket injector using oxygen and RP-1 propellants at high chamber pressures of 20,682 kPa (3000 psia) is presented. This analytical investiga-

tion includes combustion efficiency versus injector element type, combustion stability, and combustor cooling requirements. The design and fabrication of a subscale injector/acoustic resonantor assembly capable of providing a nominal thrust of 222K N (50,000 lbF) is presented. S.L.

N82-10110*# Thermacore, Inc., Lancaster, Pa.
HEAT PIPE HEAT REJECTION SYSTEM AND DEMONSTRATION MODEL FOR THE NUCLEAR ELECTRIC PROPULSION (NEP) SPACECRAFT Final Report
Donald M. Ernst Mar. 1981 139 p refs Prepared for JPL (Contracts NAS7-100; JPL-955100)
(NASA-CR-164878) Avail: NTIS HC A07/MF A01 CSCL 21F

The critical evaluation and subsequent redesign of the power conversion subsystem of the spacecraft are covered. As part of that evaluation and redesign, prototype heat pipe components for the heat rejection system were designed fabricated and tested. Based on the results of these tests in conjunction with changing mission requirements and changing energy conversion devices, new system designs were investigated. The initial evaluation and redesign was based on state-of-the-art fabrication and assembly techniques for high temperature liquid metal heat pipes and energy conversion devices. The hardware evaluation demonstrated the validity of several complicated heat pipe geometries and wick structures, including an annular-to-circular transition, bends in the heat pipe, long heat pipe condensers and arterial wicks. Additionally, a heat pipe computer model was developed which describes the end point temperature profile of long radiator heat pipes to within several degrees celsius. T.M.

N82-10111*# Hadron, Inc., Arlington, Va. Systems Management Support Div.
AYAME/PAM-D APOGEE KICK MOTOR NOZZLE FAILURE ANALYSIS
22 Jun. 1981 29 p
(Contract NAS5-26538)
(NASA-CR-166735) Avail: NTIS HC A03/MF A01 CSCL 21H

The failure of two communication satellites during firing sequence were examined. The correlation/comparison of the circumstances of the Ayame incidents and the failure of the STAR 48 (DM-2) motor are reviewed. The massive nozzle failure of the AKM to determine the impact on spacecraft performance is examined. It is recommended that a closer watch is kept on systems techniques. E.A.K.

N82-10112# Research Inst. of National Defence, Stockholm (Sweden). Huvudavdelningen foer Marinmateriel.
AGE CONTROL OF THE RB 52 ROCKET ENGINE [AADRINGSKONTROLL AV RAKETMOTORER FOER RB52]
Bert Anderson Sep. 1980 45 p In SWEDISH
(FOA-C-20366-D3) Avail: NTIS HC A03/MF A01

Reference testing of these rocket engines was done by test firing of robots starting in 1966. Ten of them were tested at normal temperature, 20 C, and five at -40 C. The starting stage pressure, driving stage pressure and driving force were recorded. All the firings show normal performance without disturbances. Author (ESA)

N82-10113# European Space Agency, Paris (France).
SYMPHONIE. NATURAL NUTATION DAMPING DUE TO THE ERGOLS OF THE HOT GAS PROPULSION SYSTEM. SYNTHESIS OF MV1 AND MV2 IN FLIGHT RESULTS
J. L. Marce Jun. 1981 9 p refs Transl. into ENGLISH of "SYMPHONIE. Amortissement Naturel de la Nutation du aux Ergols du Systeme Gaz Chaud. Synthese des Results en vol sur MV1 et MV2", Rept. CNES-79/CT/PRT/SST/SS/166, CNES, Toulouse, May 23, 1979 Original report in FRENCH previously announced as N81-20170
(ESA-TT-698; CNES-79/CT/PRT/SST/SS/166) Avail: NTIS HC A02/MF A01

In-flight measurements of nutation damping onboard SYMPHONIE satellites are interpreted, and a prediction model, which determines the time constant for nutation damping as a result of momentum energy being dissipated by liquid propellants in fuel tanks, is verified. Although model predictions disagree with in-flight measurements, they accurately portray the variation in damping time constant in function of tank fuel level. The radial motion of the satellite momentum wheel is evoked to explain the difference between computation and measurement. Author (ESA)

N82-10114# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Stuttgart (West Germany). Inst. fuer Technische Physik.
PHYSICAL RESULTS AND PROBLEMS OCCURRING DURING THE QUALIFICATION OF THE THRUSTER RIT-10 Ph.D. Thesis - Justus-Liebig Univ.
Eberhard Zeyfang Sep. 1980 131 p refs Report will also be announced as translation (ESA-TT-718) In GERMAN; ENGLISH summary
(DFVLR-FB-81-03) Avail: NTIS HC A07/MF A01; DFVLR, Cologne DM 27.80

As a part of the qualification of the radiofrequency ion thruster RIT-10, a preliminary life test on three thrusters was carried out. During this test run in a special test facility, 8200 thrusting hours of continuous operation and, in a cycling mode, 2200 hours of thrust at 1100 cycles were achieved. The low increase of thruster input power and the decrease of optimal negative high voltage can be correlated to erosion of the extraction holes by ion impact. The life test data lead to a calculated lifetime limit for RIT-10 of more than 10,000 hours. Author (ESA)

N82-11011# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE ACOUSTIC INSTABILITY OF COMBUSTION IN SOLID PROPELLANT ROCKET MOTORS WITH TUBULAR GRAIN
Wu Xinping *In its* Recent Selected Papers of NW Polytech. Univ., pt. 2 (FTD-ID(RS)T-0260-81-Pt-2) 28 Aug. 1981 p 412-413 refs Transl. into ENGLISH from Recent Selected Papers of NW Polytech. Univ., pt. 2 (Xian Shaanxi), 1979 (For primary document see N82-10996 01-99)
Avail: NTIS HC A18/MF A01

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N82-10115 Louisiana State Univ. and A&M Coll., Baton Rouge.
METHANE PRODUCTION FROM ALKALINE FOOD WASTE Ph.D. Thesis
Wilson Thomas Gautreaux, Jr. 1981 222 p
Avail: Univ. Microfilms Order No. 8117624

Because of waste generated by potato processing contained significant quantities of carbohydrate degradation products and sodium carbonate anaerobic digestion was determined to be a reliable process for waste treatment and methane production. The high sodium levels did not inhibit anaerobic digestion at a substate concentration of 1.0 wt percent alkaline peel solids. In two-stage bench-scale studies at 37 C, methane production averaged 0.28 m cu/kg COD feed or 0.65 m cu/(m cu d) in a settled bacterial sludge methane fermenter with a 4 day retention time. A pilot-scale anaerobic digestion system with a 15.4 m cu fermenter demonstrated the feasibility of a proposed anaerobic pond system for a food processing plant. With a 1.0 wt percent alkaline solids feed and a 9-day retention time, methane production averaged 0.16 m cu/kg solids or 0.18 m cu/m cu d). A process for single cell protein production via the acid stage of anaerobic digestion was explored. Bacterial cell and protein yields of 0.18 and 0.09 kg/k glucose consumed were obtained at a retention time of four hours. Dissert. Abstr.

N82-10116# Department of Energy, Washington, D. C. Office of Basic Energy Sciences.
MATERIALS SCIENCES PROGRAMS
Sep. 1981 180 p
(DE81-030306; DOE/ER-0106) Avail: NTIS HC A09/MF A01

Laboratory and university research activities being performed under the auspices of DOE are listed under the following headings:

(1) metallurgy and ceramics; (2) solid state physics; and (3) materials chemistry, as an aid to administrators, managers, and scientists in coordinating research and in selecting new programs. The title of each of 467 projects and its description is given along with the names of the personnel involved, the funding level, budget activity number, and key words and phrases. Indexes show investigators, materials, techniques, phenomena, and environments. A.R.H.

N82-10117# Department of Energy, Washington, D. C. Div. of Chemical Sciences.
SUMMARIES OF FY 1981 RESEARCH IN THE CHEMICAL SCIENCES
Aug. 1981 273 p
(DE81-030000; DOE/ER-0105) Avail: NTIS HC A12/MF A01

Information useful to chemist, physicists, chemical engineers, and others who are considering the possibilities of proposing research for support by the DOE is presented. The information is intended to provided a rapid means of becoming aquainted with the chemical sciences program to members of the scientific and technological community. R.C.T.

N82-10118 Texas Univ. at Arlington.
SYNTHETIC ASPECTS OF CARBON MONOXIDE CHEMISTRY Ph.D. Thesis
Sun-Chueh Kao 1981 178 p
Avail: Univ. Microfilms Order No. 8119314

A general picture of the chemical properties of metalocarboxylic acids of transition metals was obtained by studying the decarboxylation of triphenybphoshino cyclopentadienyl carboxyiron carbonyl. The reducing capability of the metallocarboxylic acid of transition metal either as an isolated species in a stoichiometric system or as a reactive intermediate in a catalytic system as examined in the reduction of nitro compounds. It is believed that a study of the chemistry of the homogeneous analogues of proposed reactive intermediates of a revised mechanism for the Fischer-Tropsch reaction should shed some light on the homogeneous Fischer-Tropsch reaction. To investigate these possibilities a series of binuclear bridgin complexes of iron were synthesized and their chemistry studied through their photolytic, thermal, and oxidative reactions. These studies gave indications that the binuclear bridging complexes can serve as sources of hydrocarbons and that the bimetalocyclic complexes, though not isolated, might be involved in the reaction sequence which led to the hydrocarbon formation. Dissert. Abstr.

24 COMPOSITE MATERIALS

Includes laminates.

N82-10119 Drexel Univ., Philadelphia, Pa.
FRACTURE ANALYSIS OF (PLUS OR MINUS 25/90 SUB N) SUB S GRAPHITE-EPOXY COMPOSITE LAMINATES Ph.D. Thesis
George Ernest Law, Jr. 1981 158 p
Avail: Univ. Microfilms Order No. 8118931

The mechanisms of transverse cracking, ply delamination, and their interactions were investigated in a series of graphite-epoxy composite laminates of the form (plus or minus 25/90 sub n) sub s. By varying the thickness of the 90 deg layer, (indicated by n) which is the single parameter separating the fracture events, several important and distinct fracture modes are identified. The energy release rate approach of classical fracture mechanics is applied to describe the fracture processes, including the crack initiation, growth, and growth stability. The cracking process is numerically simulated using a finite element procedure formulated within the framework of ply elasticity and on the assumption of a generalized plane strain state. The numerical procedure explicitly calculated the mode 1, mode 2, and mode 3 components of the energy release rate as a function of the crack length. The analytical model predicts the sequence of occurrence of the various fracture modes, the critical onset loads, the process of crack growth, and the growth stability. A good agreement was obtained between the theoretical and experimental results. Dissert. Abstr.

N82-10120*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
MASS LOSS OF TEOS-COATED RCC SUBJECTED TO THE ENVIRONMENT AT THE SHUTTLE WING LEADING EDGE
C. W. Stroud and Donald R. Rummler Sep. 1981 59 p refs
(NASA-TM-83203) Avail: NTIS HC A04/MF A01 CSCL 11D

Coated, reinforced carbon-carbon (RCC) is used for the leading edges of the Space Shuttle. The mass loss characteristics of RCC specimens coated with tetra-ethyl-ortho-silicate (TEOS) were determined for conditions which simulated the entry environment expected at the stagnation area of the wing leading edge. Maximum specimen temperature was 1632 K. Specimens were exposed for up to 100 missions. Stress levels up to 8.274 MPa caused an average increase in oxidation of 6 percent over unstressed specimens. Experimentally determined mass losses were compared with those predicted by an existing empirical analysis. Author

N82-10121*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
DEGRADATION MECHANISMS IN ALUMINUM MATRIX COMPOSITES: ALUMINA/ALUMINUM AND BORON/ALUMINUM Ph.D. Thesis - North Carolina State Univ. at Raleigh
George C. Olsen 1981 139 p refs
(NASA-TM-84055) Avail: NTIS HC A07/MF A01 CSCL 11D

The effects of fabrication and long term thermal exposure (up to 10,000 hours at 590 K) on two types of aluminum matrix composites were examined. An alumina/aluminum composite, was made of continuous alpha Al2O3 fibers in a matrix of commercially pure aluminum alloyed with 2.8% lithium. The mechanical properties of the material, the effect of isothermal exposure, cyclic thermal exposure, and fatigue are presented. Two degradation mechanisms are identified. One was caused by formation of a nonstoichiometric alumina during fabrication, the other by a loss of lithium to a surface reaction during long term thermal exposure. The other composite, boron/aluminum, made of boron fibers in an aluminum matrix, was investigated using five different aluminum alloys for the matrices. The mechanical properties of each material and the effect of isothermal and cyclic thermal exposure are presented. The effects of each alloy constituent on the degradation mechanisms are discussed. The effects of several reactions between alloy constituents and boron fibers on the composite properties are discussed. J.M.S.

N82-10122# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Metallurgy and Materials Science.
GENERALIZATION OF INTERNAL CENTRIFUGAL ZONE GROWTH OF METAL-CERAMIC COMPOSITES AND KINETICS, MORPHOLOGY AND THERMODYNAMICS OF THE SOLID-LIQUID TRANSITION OF NON-METALS Final Report, 1 Dec. 1973 - 31 May 1981
Robert F. Sekerka May 1981 12 p refs
(Contract DE-AS02-76ER-02407)
(DE81-027884; DOE/ER-02407/9) Avail: NTIS HC A02/MF A01

The fundamental instability phenomena that can occur during the induction heating and melting of ceramics was quantified and a model of the ICZG process that can serve to guide the crystal grower in process optimization and adaption to new materials was completed. A proof, independent of any statistical model, of the Onsager reciprocal relations for multicomponent diffusion and heat flow in fluids was obtained, the fundamental concepts inherent in the existence of constitutive relations were developed and the way was paved toward extension of these developments to solids and to solid-fluid interfaces. DOE

N82-10123# Colorado Univ., Boulder.
DIAGNOSTICS OF A GLOW DISCHARGE USED TO PRODUCE HYDROGENERATED AMORPHOUS SILICON FILMS Final Report, 15 Feb. 1980 - 14 Apr. 1981
A. Gallagher and J. Scott 1981 20 p Sponsored in part by Midwest Research Inst.
(Contract DE-AC02-77CH-00178)
(SERI/TR-9053-1-T3) Avail: NTIS HC A02/MF A01

The glow discharge deposition apparatus, with mass spectrometer sampling, was constructed and tested with Ar and SiH4 gas. It successfully achieved the desired high vacuum, gas flow rates, and mass spectrometer sensitivities. Ion and neutral species were measured from the end and side of a dc discharge in SiH4, finding major changes with sampling position, gas pressure, and discharge power. The ion species from a dc proximity discharge, and from the end and sides of an RF discharge in SiH4 were studied. Qualitative comparisons were made to the dc discharge results and to approximate models for the fields and charge distributions in RF discharges. Impurity concentrations were studied in the vacuum system and silane gasews, with sensitivities of < or = 1 ppM outside of mass region overlain by SiH4 ion spectra. The impurity levels attained in the apparatus appear to be entirely due to impurities in the SiH4 gas, and are typically at the 1 to 100 ppM level. DOE

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics*.

N82-10124 Pennsylvania Univ., Philadelphia.
THE EFFECT OF PORE STRUCTURE ON THE KINETICS OF FLUID-SOLID REACTIONS Ph.D. Thesis
Suresh Kumar Bhatia 1981 356 p
Avail: Univ. Microfilms Order No. 8117758

For fluid solid reactions a random pore model was developed which accounts for arbitrary pore size distributions as well as pore intersections in a reacting solid. The model is quite versatile and subsumes the prior grain models as special cases. It is found that a rate maximum may be expected for certain pore size distributions but not for others. In the initial stages of reaction the rate increases with conversion due to increase in the surface area as pore growth occurs, but this effect is overshadowed in later stages by pore intersections which reduce surface area. The model indicates that given the porosity and surface area, a solid possessing uniform size pores is intrinsically the least reactive. The model is formulated to include as well transport effects arising from boundary layer, intraparticle and product layer diffusion. It is found that the rate and surface area maxima predicted in the kinetic regime are shifted to lower conversions as intraparticle or product layer diffusional resistances increase. Dissert. Abstr.

N82-10125 Texas Univ. at Arlington.
DEGASSING PHENOMENA FROM LIQUID-GAS SOLUTIONS AFTER RAPID DECOMPRESSION Ph.D. Thesis
Ho-Young Kwak 1981 124 p
Avail: Univ. Microfilms Order No. 8119323

The basic experiments consist of a decomposition experiment where a water-methane solution, was decompressed to atmospheric pressure. The induction time for bubble formation was found depends on the pressure reduction time. In addition to the basic experiments, a series of experiments was conducted where an external disturbance was applied during the decompression process. External disturbances included were ultrasonic sound, an electric field, and a pure shear flow. Various solutions used were pure water, and water with surfactant. The ultrasonic and shear flow disturbances wre the most effective method of promoting homogeneous bubble formation. Dissert. Abstr.

N82-10126 California Inst. of Tech., Pasadena.
LABORATORY STUDIES OF SUBMICRON PARTICLE FORMATION IN PULVERIZED COAL COMBUSTION Ph.D. Thesis
Dean Dalton Taylor 1981 314 p
Avail: Univ. Microfilms Order No. 8119592

A laboratory furnace was constructed to study the mechanism of submicron particle formation in pulverized coal boilers. Simulation was achieved by matching characteristic kinetic times in laboratory and field units. This was done by matching volumetric heat extraction rates. Reynolds number and geometric scaling were not deemed essential for the simulation. Combustion-generated submicron aerosols from the laboratory furnace were characterized by size and composition distribution measurements using an electrical mobility analyzer and a low-pressure impactor. Elemental analysis of size-classified mass samples was done by alpha particle-induced X-ray emission spectrum analysis. The influence of macroscopic combustion parameters on the characteristics of fine particle emissions was investigated. Total submicron particle volume concentration was found to depend on burner type and to increase with temperature for each burner type tested. The particle volume concentration was found to increase with exhaust NO concentration. Dissert. Abstr.

N82-10127 Polytechnic Inst. of New York, Brooklyn.
LASER DIAGNOSTICS IN JETS AND FLAMES Ph.D. Thesis
Anthony Celentano 1981 165 p
Avail: Univ. Microfilms Order No. 8118863

An integrated four component pulsed vibration Raman scattering one dimensional laser Doppler velocimeter scattering measurement system is applied to nonreacting and reacting free jet flows. Simultaneous, instantaneous, nonintrusive, remote, and measurements of velocity, temperature and specie concentration are shown. In addition, specie concentration second and third order scalar cross correlation distributions are presented as a measure of specie mixing. It is found that many experimental parameters needed for theoretical flow modeling can be obtained by this measurement system. A highly implicit numerical code was written and applied to model the nonreacting turbulent jet flow. The code is extended to model a premixed methane-air reacting free jet flow using a one-step global 'laminar' Arrhenius rate chemical source term. It is found that agreement existed between the numerical solution and experimental measurements, but that refinements to the turbulent model and the use of a 'turbulent' chemical source term are required to obtain better agreement. Dissert. Abstr.

N82-10128 Clemson Univ., S.C.
APPLICATIONS OF CIBS THEORY Ph.D. Thesis
Lynn Elizabeth Lewis 1981 157 p
Avail: Univ. Microfilms Order No. 8117929

Applications of the differential equation formulation of 'corrections to an incomplete basis set' theory to systems of greater than two electrons are discussed. Results are reported for several basis sets of the He, Be, H2, LiH, Li2, and H2O systems. It is shown that the method is convergent and feasible for molecular systems. The method results in a significant improvement in energies and a relative reduction in computer time since iterative calculations are not required. Dissert. Abstr.

N82-10129 Polytechnic Inst. of New York, Brooklyn.
VIBRATIONAL RELAXATIONS IN A LARGE MOLECULAR SYSTEM BY RAMAN AND INFRARED SPECTROSCOPY Ph.D. Thesis
Ellen Veronica Miseo 1981 173 p
Avail: Univ. Microfilms Order No. 8118888

The vibrational correlation functions of the vibrations in the molecule 4-n-octyloxy 4 prime-cyanobiphenyl in the isotropic phase and in solution were examined. Their relaxation behavior was also determined. A comparison of the infrared and Raman data was also planned. The spectra of the solutions were collected using a Jobin Yvon Ramanor HG2 for the Raman spectra and a Digilab FTS-20C for the infrared spectra. The programs used to calculate the vibrational correlation functions along with other data handling routines were written in the lab. Dissert. Abstr.

N82-10130 California Univ., Davis.
STUDIES IN SINGLE-CRYSTAL X-RAY DIFFRACTOMETRY: TAILORING MEASUREMENT STRATEGY TO PROJECT NEEDS Ph.D. Thesis
Brenda Gail Nichols 1981 280 p
Avail: Univ. Microfilms Order No. 8117583

A Syntex P2 sub 1 diffractometer was used to collect low temperature data (140 K) for three structures by the scan techniques, allowing 1 sec for scan and 0.5 sec each for two background measurements for each reflection, yielding about 400

reflection/hour. The compounds studied were: (1) 1-5-dithiacyclooctane iodine adduct, C6H12S2I4; (2) 4,4'di-(2-methoxycarbonlyethyl)--3, 3', 5, 5' - tetranmethylpyyromethene Hydrochloride, C21H29N2O4Cl;(3) (1-(acetylamino) ethylidenesulfamic acid, C4H8 N2O4S. Recognizable solutions were derived without difficulty from each data set. The results were compared with those obtained from conventional data (30 sec/scan, 15 sec each for two backgrounds). In general the fast data collection resulted in a 50% increase in positional e.s.d.'s. A Picker diffractometer was used to collect low-temperature (85 K) high-order data on pentaerythritol, C(CH-2OH)4. A total of 1939 reflections were collected. Full-matrix least-squares refinements yielded hydrogen positions which gave 0.96(3) A for the O-H bond. A program was written (RATIO) which calculates the average ratio of the observed/calculated structure factors for the reflection contained in a two theta rage. Dissert. Abstr.

N82-10131 Wisconsin Univ. - Madison.
MICROWAVE SPECTROSCOPY OF THE CARBON MONOXIDE ION AND THE FORMYL ION AND DEVELOPMENT OF RELATED COMPUTER PROGRAMS Ph.D. Thesis
Nancy Diane Piltch 1981 381 p
Avail: Univ. Microfilms Order No. 8116010

Computer programs were written for on line control of a microwave spectrometer and a quadrupole mass spectrometer. Both programs provide signal averaging and data storage capabilities. The microwave program is used with the phase locked spectrometer, and includes signal enhancement options via data smoothing, and for tone-burst modulation, baseline suppression. Another program was written to perform a least squares fit of the microwave data to a model lineshape appropriate to the tone burst modulation scheme. Dissert. Abstr.

N82-10132 California Univ., Irvine.
THE SIMULATION AND INTERPRETATION OF VIBRATIONAL ISOTOPE EFFECTS Ph.D. Thesis
Stephen Anthony Skaron 1981 192 p
Avail: Univ. Microfilms Order No. 8118490

The magnitude of the reduced partition function (s sub 2/s sub 2)f values and th isotopes effects on chemical equilibria which can be calculated from these quantities are investigated. In such an analysis, one does not need to consider normal mode vibrational frequencies, but considers the frequencies corresponding to non-interacting individual coordinates to (s sub 2/s sub 1)f values an to isotope effects on equilibrium constants are presented. The reduced isotopic partition function ratios (s sub 2/s sub1)f (C13/C12) are dissected by perturbation theory for a series of alkanes. It is shown that the major contribution of the P factors can be included with the c factors to form the c prime factors and that then very few well characterized P factors are necessary to approximate (s sub 2/s sub 1)f. Moreover, the C prime an P factors corresponding to given types of cordinates are similar so that it is suggested that all the alkane (s sub 2/s sub 1)f(C13/C12) values can be estimated from a table of average c prime and P factors. The H/Mu isotopic exchange reaction and oxygen, isotopic abundances in carbonaceous meteorites were also examined. Dissert. Abstr.

N82-10133 Wisconsin Univ. - Madison.
VACUUM ULTRAVIOLET PHOTOCHEMISTRY AND FOURIER TRANSFORM INFRARED SPECTROSCOPY OF SOFT X-RAY PHOTORESISTS Ph.D. Thesis
Paul William Bohn 1981 238 p
Avail: Univ. Microfilms Order No. 8116637

Synchrotron radiation was employed to study the vacuum ultraviolet absorption spectra of polymethylmethacrylate (PMMA) polybutene-l-sulfone (PBS), and a partially cyclized polycis-isoprene resist (K747). Quantitative spectral measurements of their linear absorption coefficients were made possible by the fabrication of 100 nm thick free standing SiO2 windows upon which 150-850 nm thick experimental polymer films were applied. A 3 x 3 array of 100 micrometers x 100 micrometers windows was anisotropically etched into (100) n type silicon with a 1:1 H2O:N2H4 mixture. Results showed mu sub (PMMA) = 1.4 - 1.8 x 10 to the 5th power/cm mu sub 1 (PRS) = 3.4 - 3.6 x 10 to the 4th power/cm and mu sub/ (K747) = 2.4 - 3.0 x 10 to the 4th power/cm from 17 to 32 nm. This ordering is in contrast with previous resist sensitivity data. Absorption, however, measures the amount of energy deposited in a film, whereas sensitivity gauges the effectiveness with which that energy causes chemical change. High precision calculated differences between the Fourier transform infrared spectra of irradiated and nonirradiated films were employed to identify major photofragments and to characterize the radiation dose dependence of the photochemical pathways. Dissert. Abstr.

N82-10134 Virginia Commonwealth Univ., Richmond.
HETEROGENEOUS ELECTRON TRANSFER KINETIC PARAMETERS OF HEMEPROTEINS AS STUDIED BY CHANNEL FLOW HYDRODYNAMIC VOLTAMMETRY Ph.D. Thesis
James Francis Castner 1981 129 p
Avail: Univ. Microfilms Order No. 8118962

The technique of channel flow hydrodynamic voltammetry was used to elucidate the heterogeneous electrochemical behavior of the hemeproteins myoglobin and cytochrome. Sperm whale myoglobin was principally studied due to its stability and availability even though physiologically this hemeprotein does not function as an electron transporting agent. A methyl viologen modified Au foil electrode was used in this investigation. The modified electrode surface facilitated the reversible reduction and oxidation of myoglobin as was demonstrated by the technique of spectroelectrochemistry. Channel flow hydrodynamic voltammetry provided rapid attainment of steady state reaction conditions which resulted in the acquisition of precise kinetic measurements. Dissert. Abstr.

N82-10135 Texas Univ. at Arlington.
PHOTOELECTROCHEMICAL REACTIONS OF PARTICULATE SEMICONDUCTOR SYSTEMS Ph.D. Thesis
Wendell Wayne Dunn 1981 192 p
Avail: Univ. Microfilms Order No. 8119283

The mechanism of the photoreaction at the suspended particle is considered with respect to the semiconductor properties of the mateials. The photodeposition of Pt and Pd on semiconductor powders from an aqueous solution containing the metal salt and acetate provides a technique for the preparation of supported catalysts. The physical properties of the catalysts are examined by scanning Auger and X-ray photoelectron spectroscopy and by X-ray diffraction techniques. Experiments are conducted to compare the photoprocesses at the powder are compared to the photoelectrochemical behavior of single crystal electrode materials. The photooxidation of oxalic acid at TiO2 and Pt/TiO2 under oxygen free and oxygen saturated conditions is examined. The oxidation process is analogous to the photocatalytic oxidation o acetate (the photon-Kolbe). Ti(3+) is produced by the irradiation of oxalate in suspensions of TiO2, thus suggesting that Ti(3+) is an intermediate environment of the photogenerated electron. Dissert. Abstr.

N82-10136 Colorado State Univ., Fort Collins.
EXPERIMENTAL MODELING OF AEROSOL PRODUCTION, TRANSPORT, AND VAPORIZATION FOR PLASMA SPECTROSCOPY Ph.D. Thesis
Stephen James Freeland 1981 230 p
Avail: Univ. Microfilms Order No. 8119702

The process of converting an aqueous sample into an atomic vapor within the optical path of an atomization source are delineated with repect to nebulization of the sample, transport and evaporation of the aqueous aerosol, and vaporization and motion of the dry analyte salt as well as diffusion of the analyte atoms within the flame or plasma. It is shown that small aerosol drops are desirable to avoid removal via inertial impaction, that at th po velocity is necessary to produce small aqueous aerosol drops while low overall gas flow is desirable in terms of atomic vapor dilution in the source, and that analyte spread in a flame is due to horizontal drag forces acting on analyte aerosol which enters the flame very near the slot watt. Analysis of scanning electron micrographs of dry aerosol particles confirms crustal formation for large particles (approximately 1 micro M). It is also shown that smaller dry particles are less dense than the larger ones providing support for the conclusion that crustal formation may also affect small droplets. Dissert. Abstr.

N82-10137 Emory Univ., Atlanta, Ga.
NMR STUDIES OF MOLECULAR STRUCTURE USING LYOTROPIC AND THERMOTROPIC LIQUID CRYSTAL SOLVENTS Ph.D. Thesis
William Eric Bechtold 1980 159 p
Avail: Univ. Microfilms Order No. 8119143

The hydrogen magnetic resonance spectrum of naphthalene was obtained in an orienting lyotropic liquid crystal solvent based on potassium laurate, and the results of the spectral analysis were used to calculate the proton geometry of the molecule. Vibrational corrections based on a full normal coordinate treatment were applied to the structure and the effect of different weighting schemes was investigated. The results are compared with those obtained in thermotropic media and by other structural methods. Dissert. Abstr.

N82-10138# Oakland Univ., Rochester, Mich. Dept. of Chemistry.
POTENTIAL ENERGY FUNCTIONS FOR THE SOLVATION OF ALKALI METAL CATIONS
P. P. Schmidt 1 Aug. 1981 38 p refs Submitted for publication
(Contract N00014-77-C-0293; NR Proj. 359-648)
(AD-A103994; TR-10) Avail: NTIS HC A03/MF A01 CSCL 07/2

The purpose of this paper is to explore the use of several model potential energy functions in order to try better to understand the nature of the ofrces which operate between simple monatomic cations and the molecules of solvent which surround them. This work builds upon and extends a recently reported initial treatment. In that report, the potential energy was modelled as the sum of an exponential (Born-type) repulsion and an ionic-dipolar attraction. In this paper we consider composite functions which consist variously of an exponential form of repulsion or an inverse R-12 repulsion, and attractions which are expressed in terms of the basic ionic-dipolar terms together with additional terms which depend upon the polarizabilities of the ion and the solvent. No more than two adjustable parameters are used. The force constants for the far infrared-active vibrations of the caged ions are known. With the use of the equilibrium condition for the cage of solvent, the values of the parameters can be determined. GRA

N82-10139# Oakland Univ., Rochester, Mich. Dept. of Chemistry.
THE ELECTROGENERATION OF SOLVATED METAL ATOMS. 2: ANALYSES OF THE STABILITIES OF SOLVATED CATIONS AND ATOMS Technical Progress Report, 31 Apr. 1980 - 31 Jul. 1981
P. P. Schmidt and B. S. Pons (Alberta Univ., Edmonton, Canada) 1 Aug. 1981 58 p refs Submitted for publication
(Contract N00014-77-C-0293; NR Proj. 359-648)
(AD-A103993; TR-11) Avail: NTIS HC A04/MF A01 CSCL 07/2

The purpose of this paper is to investigate mechanical models of ionic and atomic solvation in order to suggest a part of the mechanism of the electroreduction of metal ions. We use a Morse potential, the parameters for which are determined with the use of spectroscopic information, to try to predict the mechanical properties of a solvated atom. In particular, the solvated ionic and atomic systems are allowed to approach and interact with a metallic surface. Changes in the positions of the equilibria and changes in the calculated force constants are determined. We defined accurate adionic and adatomic states. In these states the ion or atom occupies an expanded cage which includes the solvent and the surface of the metal. The activation energies for the formation of adions may be much larger than the activation energies for the formation of the related adatoms. Thus, if a reduction should occur at the outer Helmholtz plane, a solvated atom can be formed. In the vicinity of the surface, such a solvated atom can desolvate much more readily than the ion. The strength with which solvent or ligand is associated with a zero-valent metallic species, we believe, influences strongly the character of the metallic deposit formed. GRA

N82-10140# Martin Marietta Labs., Baltimore, Md.
INTERFACE PROPERTIES AND SURFACE LEAKAGE OF (Hg,Cd)Te PHOTODIODES Final Report, 30 Aug. 1979 - 30 Apr. 1981
S. P. Buchner, G. D. Davis, W. A. Beck, and N. E. Byer Jul. 1981 75 p refs
(Contract DAAK70-79-C-0134)
(AD-A104014; MML-TR-81-39C) Avail: NTIS HC A04/MF A01 CSCL 09/1

The passivation of Hg(0.8)Cd(0.2)Te photodiode surfaces by an anodic oxide, ZnS, and a bilayer consisting of ZnS covering the anodic oxide was investigated using a combination of electrical and surface spectro-scopic techniques. This approach has allowed us to relate the electrical characteristics of the different passivants with the interface chemistry. The electrical properties of the passivants were revealed by capacitance-voltage measurements of MIS devices and by current-voltage and capacitance-voltage measurements of gate-controlled diodes. X-ray photoelectron spectroscopy together with argon sputtering has provided information both on the chemical species present in the vicinity of the interface and on their chemical states. Our results for the anodic oxide reveal an apparently very non-ideal interface with a substantial Hg depletion in the semiconductor near the interface, yet the density of interface states is quite small ($< 5 \times 10$ to the 11th power/sq cm /eV). However, the presence of a large positive charge in the oxide produces an inverted surface in the p-region of the diode which is detrimental to diode operation since it opens up a large channel for surface leakage current. GRA

N82-10141# Illinois Inst. of Tech., Chicago Dept. of Engineering.
SEPARATION OF PARTICLES FROM COAL DERIVED LIQUIDS VIA SURFACE CHARGE PROPERTIES Final Report, Aug. 1977 - May 1981
Dimitri Gidaspow and Darsh Wasan Jul. 1981 97 p refs
(Contract DE-AS02-77ET-10445)
(DE81-029088; DOE/ET-10445/1) Avail: NTIS HC A05/MF A01

An improved method of removal of fine particles suspended in nonaqueous media by the application of a high-voltage (1000 to 10,000 V/cm) electric field was developed. The technique is a modification of ordinary cross-flow filtration with a porous tube and of forced flow electrophoresis. The electrofilter was tested with a synthetic nonaqueous slurry as well as samples of diluted H-coal process liquids obtained from a coal liquefaction pilot plant at various electric field strengths, driving pressures, and feed rates. Models of clear boundary layers for flat and tubular cross-flow electrofilters were developed as a function of inlet Peclet number, electrophoretic velocity of particles, and rate of filtration. DOE

N82-10142# Massachusetts Inst. of Tech., Cambridge. Energy Lab.
MODEL PATHWAYS IN LIGNIN THERMOLYSIS Ph.D. Thesis
Michael T. Klein and Preetinder S. Virk Feb. 1981 99 p refs
(Contract DE-AM01-76EI-02295)
(DE81-029767; MIT-EL-81-005) Avail: NTIS HC A05/MF A01

A total of 20 model compound pyrolysis substrates were selected to mimic the important reactive functional groups present in whole-lignin thermolysis. The more salient models were: phenethyl phenyl ether (PPE), which depicts the most prevalent lignin interunit linkage; guaiacol, model of the predominant aromatic methoxyl; and saligenol and cinnamyl alcohol, models of important propanoid side chains. Detailed pathway and kinetic analyses and determination of reaction Arrhenius parameters provided mechanistic insights into the model compound pyrolyses. Several pericyclic reaction mechanisms, hitherto not mentioned in the lignin pyrolysis literature, were suggested. DOE

N82-10143# State Univ. of New York, Binghamton. Dept. of Chemistry.
DESULFURIZATION WITH TRANSITION METAL CATALYSTS Quarterly Technical Progress Report, 28 Mar. - Jun. 1981
John J. Eisch 31 Jul. 1981 4 p
(Contract DE-AC22-79ET-14879)
(DE81-028935; DOE/ET-14879/T6) Avail: NTIS

HC A02/MF A01

The reactivity and the intermediates in the desulfurization of 2-methyl dibenzo thiophene and certain model sulfides and sulfones were examined. The ratio of bis-1.5-cyclo octadiene nickel, the desulfurizing activity of soluble organo cobalt complexes, and the activity of aluminum hydride combinations with nickel (11), cobalt(11), and molybdenum(0) or molybdenum (IV) salts were also studied. Experimental procedures for applying these techniques to coal derived liquids were also addressed. DOE

N82-10144# Worcester Polytechnic Inst., Mass.
KINETICS AND MECHANISMS OF CATALYTIC HYDROLIQUEFACTION AND HYDROGASIFICATION OF LIGNITE Quarterly Report, Apr. - Jun. 1981
Wilmer L. Kranich, Kamel Guruz, and Alvin H. Weiss 10 Aug. 1981 24 p refs
(Contracts DE-FG22-81PC-40770; DE-AC22-77ET-10618)
(DE81-023581; DOE/PC-40770/T2; QR-2) Avail: NTIS HC A02/MF A01

The variables involved in the hydroliquefaction and hydrogasification of lignite were studied. Emphasis was placed on the catalytic batch hydroliquefaction of a range of low rank coals including two subbituminous coals, four lignites, and leonardite, as well as cellulose. These were studied both as received and after partial demineralization by washing with hydrochloric acid. DOE

N82-10145# Texas A&M Univ., College Station. Dept. of Chemistry.
REACTIVATION OF AN AMINO BONDED PHASE LIQUID CHROMATOGRAPHIC COLUMN
D. Karlesky, Dennis C. Shelly, and Isiah M. Warner 1980 13 p refs
(Contract DE-AS05-80EV-10404)
(DE81-028459; DOE/EV-10404/2) Avail: NTIS HC A02/MF A01

The reactivation of an n-propyl amine bonded phase column after deactivation with acetone is described. Using reversed phase aqueous conditions the condensation product (Schiff's base) was hydrolyzed to original reactants. Column performance was evaluated before and after deactivation and after reactivation to monitor the effectiveness of the reactivation procedure. Results showed that column performance after reactivation compared to column performance before deactivation within experimental error. DOE

N82-10146# Texas A&M Univ., College Station. Dept. of Chemistry.
INVESTIGATION OF SEPARATION MECHANISMS IN THE NORMAL AND REVERSED PHASE CHROMATOGRAPHY OF POLYNUCLEAR AROMATIC HYDROCARBONS ON AN AMINO BONDED PHASE COLUMN
Dori Karlesky, Dennis C. Shelly, and Isiah M. Warner 1980 27 p refs Sponsored in part by the Robert A. Welch Foundation
(Contract DE-AS05-80EV-10404)
(DE81-028461; DOE/EV-10404/6) Avail: NTIS HC A03/MF A01

Experiments were run using an n-propyl amine polar bonded phase (Chromosorb LC-9) liquid chromatographic column in both the normal and reversed phase mode. Results indicate that the mechanism of separation in the normal phase is due mainly to a charge transfer interaction between the lone pair electrons on the stationary phase nitrogen and the (LC OMEGA) electron cloud of the solute PNAs. Elution order seems to depend upon a combination of (LC OMEGA) energy, electron affinity, and type of ring condensation of the solute. Comparing plots of log I versus number of aromatic carbons for catacondensed PNAs suggest that while the specific interaction is different than that seen in silica chromatography, the overall adsorption effect is comparable. In the reversed phase the separation mechanism is either a pure partitioning effect in highly polar mobile phases (methanol/water), or a mixture of liquid-solid adsorption and liquid-liquid partition in less polar solvent systems (acetonitrile/water). DOE

N82-10147# Texas A&M Univ., College Station. Dept. of Chemistry.
RECENT ADVANCES IN MULTICOMPONENT FLUORESCENCE ANALYSIS
Isiah M. Warner and Linda B. McGown (California State Univ., Long Beach) 1980 190 p refs
(Contract DE-AS05-80EV-10404)
(DE81-028337; DOE/EV-10404/T4) Avail: NTIS HC A09/MF A01

Examples of the recent advances in multicomponent fluorescence analysis are presented. This review is limited in scope to developments in instrumental methods although there is a brief review of multicomponent data reduction. DOE

N82-10148# Yale Univ., New Haven, Conn. School of Medicine.
DEVELOPMENT OF NEWER METHODS FOR THE ISOLATION AND IDENTIFICATION OF CERTAIN COMPONENTS FOUND IN COMPLEX MIXTURES DERIVED FROM ENERGY SOURCES AND THE DETERMINATION OF THEIR BIOLOGICAL ACTIVITY VIA BIOASSAY SYSTEMS Progress Report, Aug. 1980 - Jul. 1981
S. R. Lipsky Jul. 1981 29 p refs Prepared in cooperation with LASL, N. Mex.
(Contract DE-AS02-76EV-02958)
(DE81-028311; DOE/EV-02958/T1) Avail: NTIS HC A03/MF A01

A composite sample of Paraho crude oil was fractionated and the fractions chemically identified by multidimensional gas chromatography. The fractions were then bioassayed to determine their biological activity. DOE

N82-10149# University of Southern California, Los Angeles.
CHEMISTRY AND STRUCTURE OF COAL-DERIVED ASPHALTENES AND PREASPHALTENES Quarterly Progress Report, Jul. - Sep. 1980
T. F. Yen 1980 22 p refs
(Contracts DE-AC22-76ET-10626; EX-76-C-01-2051)
(DE81-025932; DOE/ET-10626/T1) Avail: NTIS HC A02/MF A01

In order to determine the role of oxygen in altering the microstructure of the residues and the differences in reaction paths during heat treatment, two asphaltenes, were pyrolyzed and the residues studied using Fourier transform infrared (FTIR) analysis. These were pyrolyzed under the standard conditions (N2 purge, 13 C/hr to 360 C, 5 C/hr to 500 C) and samples were taken at appropriate temperature intervals. The residues were fractionated into oil resin, asphaltenes, preasphaltene and mesophase and transformation curves obtained. Elemental analysis of the residue fractions was done for use in conjunction with FTIR analysis to get structural information. DOE

N82-10150# Energy and Environmental Research Corp., Santa Ana, Calif.
SOOT FORMATION IN SYNTHETIC FUEL DROPLETS Quarterly Technical Progress Report, 1 Apr. - 30 Jun. 1981
G. England, J. Kramlich, Y. Kwan, and R. Payne Jul. 1981 36 p
(Contract DE-AC22-80PC-30298)
(DE81-028391; DOE/PC-30298/T3; QRPR-3) Avail: NTIS HC A03/MF A01

Fuel screening studies in the 70000 Btu/h tunnel furnace were extended to include SRC-11 middle and heavy distillate fuel oils. A total of eight fuels were investigated. Soot, particulates, and NOx emission levels were obtained under comparable firing conditions for both normal and staged combustion, and at various overall excess air levels. The combustion of single-droplet streams was investigated in a controlled flow reactor. The trajectory of every SRC-11 fuel droplet was observed to determinate in a microexplosion. High speed photography showed this to be an extremely rapid event resulting in the formation of a visible, luminous soot cloud. This behavior was not observed for a petroleum-derived No. 6 oil and appeared to be pronounced for a blended SRC-11 than for either the middle or heavy distillate fuels. Preliminary measurement were also made of local soot concentrations and of the temprature of the soot sheet in the reactor system. J.M.S.

N82-10151# Ohio State Univ., Columbus. Dept. of Chemistry.
ROTATING-DISK THIN-LAYER CHROMATOGRAPHY M.S. Thesis
Deborah Louise DuPont 1980 116 p refs
(Contract DE-AC02-80ER-10554)
(DE81-025878; DOE/ER-10554/8) Avail: NTIS HC A06/MF A01

A separations technique, rotating disk thin layer chromatography (RDTLC), is reported. Several packing methods, effects of silica activation on the reproducibility, and related efficiencies of the chromatographic systems are evaluated as well as the utility of the instrument with regard to the fractionation of complex mixtures. Reproducibility is found to be excellent if the adsorbent activity is controlled. The technique is most advantages when used for preparative separations. It is also shown to be useful in the clean up of complex natural products for subsequent analysis. DOE

N82-10152# Air Products and Chemicals, Inc., Allentown, Pa.
CRYOGENIC METHANE SEPARATION/CATALYTIC HYDROGASIFICATION PROCESS ANALYSIS Quarterly Report
J. Klosek Aug. 1981 42 p
(Contract DE-AC01-78ET-10325)
(DE81-029123; DOE/ET-10325/T11) Avail: NTIS HC A03/MF A01

Two commercial gasification processor were evaluated in terms of their relative effectiveness in separating methanes from the reaction products and some of the other synthesis gas products recycled. Cryogenic methane separation results from the process gas recovered by partial condensation and carbon absorption are reported. Preliminary plant designs for acid gas removal and cryogenic methane separation from the raw gas are also reported. R.C.T.

N82-10153# Brookhaven National Lab., Upton, N. Y.
FLAME-RETENTION HEAD BURNER EFFICIENCY TEST RESULTS AND ANALYSIS: SPACE-HEATING-EQUIPMENT TEST PROGRAM
R. J. McDonald and R. F. Krajewski Nov. 1980 26 p refs
(Contract DE-AC01-76CH-00016)
(DE81-030219; BNL-51321) Avail: NTIS HC A03/MF A01

Fuel oil savings resulting from the use of flame-retention head burners in residential oil-fired hydronic heating units are summarized. Results of laboratory and field tests are compared. The fuel savings varied between 5.1% and 22.0% for various systems. DOE

N82-10154# New Hampshire Univ., Durham.
LIQUEFACTION OF BITUMINOUS COALS USING DISPOSAL ORE CATALYSTS AND HYDROGEN Quarterly Progress Report, 7 May - 7 Aug. 1981
V. K. Mathur Aug. 1981 17 p
(Contract DE-AC22-81PC-41035)
(DE81-029134; DOE/PC-41035/1) Avail: NTIS HC A02/MF A01

Hydrogenation of coal-oil slurry by hydrogen using disposal ore catalysts (DOC) with special reference to maximizing liquefaction and minimizing viscosity of product oil was studied. A number of companies were contacted to collect samples of ores and ore concentrates containing cobalt, molybdenum, nickel and other metals considered to posses catalytic activity and a commercial Co-Mo catalyst (0402T) are reported. These data are to be used as a base for evaluating the catalytic effects of the ores and minerals collected. DOE

N82-10155# Physical Sciences, Inc., Woburn, Mass.
SYNTHETIC-FUEL COMBUSTION; POLLUTANT FORMATION. SOOT-INITIATION MECHANISMS IN BURNING AROMATICS Quarterly Report, 1 Apr. - 30 Jun. 1981
T. Tanzawa, S. P. Schertzer, and W. T. Rawlins 1981 21 p refs
(Contract DE-AC22-80PC-30292)
(DE81-029480; DOE/PC-30292/3; PSI-TR-284; QR-3) Avail: NTIS HC A02/MF A01

Toluene pyrolysis experiments were performed using He-Ne laser beam attenuation to monitor soot. The experimental results were consistent with those of previous investigators; however, the laser beam attenuation records showed an anomalously large absorption at the higher temperatures where soot formation should be minimal. This effect could be due to some light-absorbing gas-phase species such as PCAH and/or radicals of PCAH. Diagnostics employed show ambiguous late-time behavior of the pressure, density, and beam attenuation profiles. DOE

N82-10156# Argonne National Lab., Ill.
CYCLONE PERFORMANCE ESTIMATES FOR PRESSURIZED FLUIDIZED-BED COMBUSTION
R. F. Henry and W. F. Podolski Jul. 1981 33 p refs
(Contract W-31-109-eng-38)
(DE81-028504; ANL/CEN/FE-81-4) Avail: NTIS HC A03/MF A01

Hot pressurized flue gas from pressurized fluidized-bed combustion must be cleaned up prior to its expansion in a gas turbine as part of the combined-cycle electric power generation concept. The performance of conventional cyclones in experimental tests has been compared with theory, with reasonable agreement. Prediction of the performance of a larger cyclone system shows that three stages should provide the cleanup required on the basis of current estimates of turbine tolerance of particulate matter. Advances in hot gas cleanup - optimized cyclones, augmented cyclones, and alternative devices should provide future improvement in cycle efficiencies and costs, but simple cyclones are planned for first-generation PFB/CC pilot and demonstration plants. DOE

N82-10157# Spectron Development Labs., Inc., Costa Mesa, Calif.
PARTICULATE PROCESSES IN PULVERIZED-COAL FLAMES Quarterly Technical Progress Report, Jan. - Mar. 1981
Apr. 1981 65 p refs
(Contract DE-AC22-80PC-30300)
(DE81-025153; DOE/PC-30300/T3) Avail: NTIS HC A04/MF A01

The design of the entire apparatus for the dilute particle reaction experiment was completed. This includes two reactor heads, a fluidized bed feeder, the tube reactor, and the reactor traverse mechanism. Experimental observations of ignition and devolatilization of Pittsburgh Seam HVA bituminous coal were initiated. Observations using both front and back light pulsed laser holography and particle sizing interferometry were made. Preliminary analysis of the data indicate that high quality results can be obtained. DOE

N82-10158# Physical Sciences, Inc., Woburn, Mass.
PULVERIZED-FUEL COMBUSTION: MODELING AND SCALEUP METHODOLOGIES Quarterly Report, 1 Apr. - 30 Jun. 1981
Paul F. Lewis, Evan R. Pugh, Nelson H. Kemp, Alan Gelb, and Thomas Wolf Aug. 1981 30 p refs
(Contract DE-AC22-80PC-30294; QR-3)
(DE81-026546; DOE/PC-30294/3; PSI-TR-280) Avail: NTIS HC A03/MF A01

Effort this quarter has continued on model improvements, and the data analysis task has begun. Specific work reported includes: model of the heterogeneous reactions of coal chars, work on particle-particle collisions, improvements in the computer code to handle the stiff nature of the particle momentum and energy equations, and identification of a set of experiments with which to start the data analysis. Results of these efforts are: a model for heterogeneous carbon reactions including OH and O reactions, a model for collisional drag effects, improved numerical stability of the code, and beginning of data analysis. DOE

N82-10159# Brigham Young Univ., Provo, Utah. Combustion Lab.
BASIC COMBUSTION AND POLLUTANT-FORMATION PROCESSES FOR PULVERIZED FUELS Quarterly Technical Progress Report, 1 Apr. - 30 Jun. 1981
Geoffrey J. Germane and L. Douglas Smoot 15 Jul. 1981 46 p refs
(Contract DE-FG22-80PC-30306)
(DE81-027279; DOE/PC-30306/T3; QTPR-3) Avail: NTIS HC A03/MF A01

Characterization of coal-water mixtures (CWM) was initiated to identify handling factors which could affect the combustion and pollutant formation. Methods of CWM preparation and utilizatio have been studied to help define the approach to be used for this research. Careful design and utilization strategies can improve lab-scale similarity in certain areas with potential commercial-scale applications. The CWM reactor modifications embody design features for detailed space-resolved combustion studies and fabrication has begun. The reactor has been designed to handle up to 45 kilograms (100 pounds) per hour of CWM, with pecise control of the inside wall temperatures. Commercial and industrially produced chars were reviewed to determine their status and availability. Six chars were identified and requested. The literature survey was continued, determinin those variables and factors that influence char reactivity. Provisions have been made to conductor characterization tests that will enable the selection of two of the six chars for the laboratory-scale combustor tests. DOE

N82-10160# Oak Ridge National Lab., Tenn. Chemical Physics Section.
RESONANCE IONIZATION SPECTROSCOPY: COUNTING NOBLE-GAS ATOMS
G. S. Hurst, M. G. Payne, C. H. Chen, R. D. Willis, B. E. Lehmann, and S. D. Kramer Jun. 1981 9 p refs Presented at Fifth Intern. Conf. on Laser Spectry. (Vicols), Alberta, British Columbia, 29 Jun. - 3 Jul. Submitted for publication Sponsored in part by Scripps Inst. of Oceanography
(Contract W-7405-eng-26)
(DE81-024252; CONF-8106100-1) Avail: NTIS HC A02/MF A01

The counting of noble gas atoms, using lasers for the selective ionization and detectos for counting individual particles (electrons or positive ions) is reported. When positive ions are counted, various kinds of mass analyzers (magnetic, quadrupole, or time-of-flight) can be incorporated to proide A selectivity. It is shown that a variety of interesting and important applications can be made with atom-counting techniques which are both atomic number (Z) and mass number (A) selective. DOE

N82-10161# California Univ., Berkeley. Lawrence Berkeley Lab. Energy and Environment Div.
SOOT VOLUME-FRACTION PROFILES IN A FREE-COMBUSTING BOUNDARY LAYER
R. A. Beier and P. J. Pagni May 1981 10 p refs Presented at the ASME 20th Natl. Heat Transfer Conf., Milwaukee, 2-5 Aug. 1981
(Contracts W-7405-eng-48; NBS-80-NAGE-6839)
(DE81-760502; LBL-12767; CONF-810804-8) Avail: NTIS HC A02/MF A01

Carbon particulate volume fraction profiles and approximate particle size distributions were measured in a free laminar combusting boundary layer for five liquid hydrocarbon fuels and polymethylmethacrylate. A multiwavelength laser transmission technique determind the most probable particle radius and a total particle concentration, which are the two unknown parameters in an assumed Gauss size distribution. In the combustion boundary layer, a sooting region exists between the pyrolyzing fuel surface and the flame. The liquid fuel soot volume fractions range from f/ sub v/ approximately 10 7 for n heptane, a paraffin, to /sub v/ approximately 10 5 for toluene, an aromatic. The PMMA soot volume fractions, f/sub v/ approximately 10 7, are approximately the same as the values previously reported for pool fires. The soot volume fraction increase slightly with downstream distance, while the standoff distance of the maximum in the f sub v profile appears to approach the converging streamline. Convection of carbon particles broadens the soot region downstream. For all fuels tested, a most probable radius between 20 nm and 50 nm is obtained which varies only slightly with distance both downstream or normal to the fuel surface. DOE

N82-10162# Oak Ridge National Lab., Tenn. Chemical Technology Div.
REMOVAL OF FLUORIDE FROM AQUEOUS NITRIC ACID
D. J. Pruett, W. B. Howerton, and J. C. Mailen Jun. 1981 26 p refs
(Contract W-7405-eng-26)
(DE81-023853; ORNL/TM-7502) Avail: NTIS HC A03/MF A01

Several methods for removing fluoride from aqueous nitric acid were investigated and compared with the frequently used aluminum nitrate-calcium nitrate Ca(2+)-Al(3+) chemical trap-distillation system. Zirconium oxynitrate solutions were found to be superior in preventing volatilization of fluoride during distillation of the nitric acid, producing decontamination factors (DFs) on the order of 2 x 2,000 (vs approximately 500 for the Ca(2+)-Al(3+) system). Several other metal nitrate systems were tested, but they were less effective. Alumina and zirconia columns proved highly effective in removing HF from HF-HNO3 vapors distilled through the columns; fluoride DFs on the order of 10 to the 6th power and 10 to the 4th power, respectively, were obtained. A silica gel column was very effective in adsorbing HF from HF-HNO3 solutions, producing a fluoride DF of approximately 10 to the 4th power. DOE

N82-10163# Sandia Labs., Albuquerque, N. Mex.
SIMULTANEOUS DETERMINATION OF ANTIMONY AND CHLORINE IN SYNTHETIC RUBBERS BY 14-MeV NEUTRON-ACTIVATION ANALYSIS
Richard W. Bild 1981 14 p refs Presented at the 6th Intern. Conf. on Mod. Trends in Activation Anal., Toronto, 15 Jun. 1981
(Contract DE-AC04-76DP-00789)
(DE81-023304; SAND-81-0156C; CONF-810682-1) Avail: NTIS HC A02/MF A01

A nondestructive method for the analysis of Sb and Cl in synthetic rubbers by 14 MeV neutron activation analysis was developed and evaluated by comparisons with microanalytical and thermal neutron activation analysis results. The method is most precise when a rubber with known amounts of Sb and Cl is used as a standard. Samples containing 0.07 to 2.5 wt percent Sb and 2.5 to 15.9 wt percent Cl were analyzed and precision for the method is 10 percent or better. Antimony and Cl detection limits are 0.02 and 0.5 wt percent respectively. Agreement among the three methods is excellent; the thermal activation analysis method is more precise and simpler to apply if only Sb needs to be determined in a sample. DOE

N82-10164# Sandia Labs., Albuquerque, N. Mex.
ELECTRICAL-TO-CHEMICAL CONNECTION
R. A. Graham 1981 5 p refs Presented at the APS Conf. on Shock Waves in Condensed Matter, Menlo Park, Calif., 23 Jun. 1981
(Contract DE-AC04-76DP-00789)
(DE81-023172; SAND-81-1350C; CONF-810684-5) Avail: NTIS HC A02/MF A01

Data on shock-induced electrical polarization in polymers are presented for polysulfone, polystyrene, and polypyromellitimide. The polarization generated in polysulfone is the largest reported for any polymer. A strong correlation is observed between the number of benzene rings in the monomer repeat unit and the magnitude of the polarization. DOE

N82-10165 State Univ. of New York at Stony Brook.
LIGHT SCATTERING FROM POLYDISPERSE MACROMOLECULAR SOLUTIONS Ph.D. Thesis
Arthur Anthony DiNapoli 1981 230 p
Avail: Univ. Microfilms Order No. 8118952

The study of macromolecular solutions is often complicated by polydispersity, which is an inevitable consequence of all synthetic polymerization reactions and some biological processes. A polydisperse solution has a distribution of molecular weights, rather than a single, well defined value. The molecular weight distribution is related to a size distribution in chrmatographic techniques where the polymer is physically segregated by passage through a porous substrate or gel medium. Similar information to that available by chromatography was obtained through a combination of elastic and quasi-elastic light scattering.
Dissert. Abstr.

N82-10166 Arizona State Univ., Tempe.
THEORETICAL MODELS FOR SOLID STATE PHASE TRANSITIONS Ph.D. Thesis
Maureen Barbara Langley 1981 192 p
Avail: Univ. Microfilms Order No. 8119962

Hysteresis in the pressure dependent solid state phase transition PrO sub 1.714-PrO sub 1.778 was modeled using a statistical thermodynamical formalism. The system was considered to be formed of a fixed number of domains, which were differentiated on the basis of size. In the case of interacting domains, particular attention was given to the clustering of domains of like phase as the transition progresses. The fraction variables representing the clustering behavior were calculated for the model system during the source of the phase transition. A statistical thermodynamical model was used to study the discontinuous ionic conductivity and heat capacity observed in stone solid electrolytes. The hysteresis which was observed in the ionic conductivity of some solid electrolytes is also investigated. A domain approach was invoked to modulate the width of the calculated hysteresis loop. The model was applied to hysteresis observed in the (Ag,Cu)2HgI4 eutectoid, YF3, and LuF3.
Dissert. Abstr.

N82-10167 California Univ., Irvine.
STUDIES OF LOW VOLATILITY COMPOUNDS BY ION CYCLOTRON RESONANCE MASS SPECTROMETRY Ph.D. Thesis
Michael James Locke 1981 394 p
Avail: Univ. Microfilms Order No. 8118479

The design and construction of an ion cyclotron resonance mass spectrometer is described which is capable of studying compounds with vapor pressure as low as 10 to the 10th power Torr. The gas phase acidities and basicities were determined for several classes of low volatility compounds including amino acids peptides, nuclear acid residues, porphyrins, and carbohydrates. The gas phase basicities for twenty common amino acids were determined by the pulsed is equilibrium technique relative to ammonia. The weakest base, glycine, is found to be 8.2 kcal/mol more basic than ammonia, while the strongest base histidine, was determined to be 28.5 kcal/mol more basic than ammonia. This range over 20 kcal/mol can be compared to aqueous solution where the basicities span a range of only 2.5 kcal/mol. These determinations allowed the enthalpies of solvation and of formation for the protonated molecular ions to be calculated. In addition, based upon substituent effects, the structure of the neutral amino acids in the gas phase has been shown to be nonionic form, rather than the zwitterionic from which predominates in solution.
Dissert. Abstr.

N82-10168 California Inst. of Tech., Pasadena.
OPTICAL DEPHASING AND ENERGY TRANSFER IN ORDERED AND DISORDERED SOLIDS: STUDIES BY LASER SPECTROSCOPY AND OPTICAL-MICROWAVE DOUBLE RESONANCE Ph.D. Thesis
Duane Donald Smith 1981 389 p
Avail: Univ. Microfilms Order No. 8118982

Electronic energy transfer and optical dephasing of ordered and disordered molecular crystals is studied theoretically and experimentally. Data on impurity band transport are presented which are consistent with the Anderson transition. The effect of dimensionality on trap-trap energy transfer thresholds is experimentally measured and modeled. Experiments focus on 1,4-dibromonaphthalene whose lowest triplet exciton is quasi-one-dimensional. Steady state and transient line narrowing laser spectroscopy provide the first unequivocal measurement of the inelastic scattering rate amongest the band states. The inelastic scattering rate (intraband exchange rate) is slow. It is significant that there is a six order of magnitude separation of time scales for the elasti and inelastic scattering, demonstrating that pure dephasing dominates the intraband exchange. For heavily trap-disordered DBN (up to 24 percent H6/D6) it is found that (1) excitation migration is step-wise incoherent, (2) energy transfer to deep traps is best fit with a t(-1/2) energy transfer rate, (3) there are no mobility edges in the trap inhomogeneous profile and (4) an upper limit for the trap homogeneous linewidth at 1.3 K is 9 GHz.
Dissert. Abstr.

N82-10169 Akron Univ., Ohio.
EVALUATION OF ERRORS IN PURITY DETERMINATIONS Ph.D. Thesis
Tuhfeh S. Habash 1981 231 p
Avail: Univ. Microfilms Order No. 8117712

The differential scanning calorimeter (DSC) produces thermograms that can be used for purity analyses of organic compounds and pharmaceuticals based on the van't Hoff equation. Because of the thermal resistance and response rate of the DSC the accuracy and precision of the method is dependent on the thermal resistance of the sample encapsulation package, sample size and heating rate. When all these variables are properly controlled an error still existed because the method not only assumes ideal solution in the liquid but also zero solid solubility. The most probable impurities are materials from which the product is made or its homologs. The chemical similarity suggests a probability of solid solubility at low concentration. An empirical correction method has been proposed for finding the temperature at which to begin integration of the peak. The solidus line for systems forming solid solutions can be determined by nuclear magnetic resonance.
Dissert. Abstr.

N82-10170 Virginia Polytechnic Inst. and State Univ., Blacksburg.
THE DEVELOPMENT OF ON-LINE LIQUID CHROMATOGRAPHY INDUCTIVELY COUPLED PLASMA ATOMIC EMISSION SPECTROMETER FOR THE ANALYSIS OF TRACE ORGANICALLY BOUND METALS AND METALLOIDS IN COAL DERIVED PRODUCTS Ph.D. Thesis
Douglas William Hausler 1981 299 p
Avail: Univ. Microfilms Order No. 8118696

A series of fractions were collected from a preparative size exclusion separation of a CHCl3 soluble SRC on BioBeads S-X4. After removal of the solvent the samples were digested using H2SO4/H2O2. Plots of metal content versus elution volume provided metal specific detection. The development of the LC-ICP interface provided simultaneous online detection for metal species separated by effective molecular size. A spray chamber to facilitate the analysis in organic solvents of relatively high volatility was developed. It also served as the interface between the LC and the ICP. Detection limits in toluene are comparable to those found in aqueous off line operation of ICP-AES. Discussions are included concerning the requirements of computer based data output and examples of the output developed are presented. Demonstration of the LC-ICP interface is achieved by size separation of three synthetic mixtures. Two of the mixture are iron and silicon organometallic species with different ligands attacked; while, the third mixture consists of 20 different metals in essentially the same ligand environmental.
Dissert. Abstr.

N82-10171 Texas A&M Univ., College Station.
RADIOACTIVATION ANALYSIS WITH HEAVY ION BEAMS Ph.D. Thesis
Bennett David Lass 1981 106 p
Avail: Univ. Microfilms Order No. 8118277

Heavy ion activation analysis (HIAA) was evaluated for the determinaton of low Z elements Z < or = 8. The experimental effort focused on nuclear reactions yielding beta(+) emitting isotopes with half-lives of > or = 10 seconds. The sample depth probed was a fer mg/cu cm. Hence, HIAA is well suited for the determination of lowest Z species in thin layers. Four heavy ion beams, Li6, Be9, C12 and N14, were found to induce reactions which could be employed for the trace analysis. Percent interferences were calculated from experimental data. The trace detection capabilities of these reactions were tested. The use of autoradiography as a spatially resolved detection system for HIAA was also investigated.
Dissert. Abstr.

N82-10172 Rutgers - The State Univ., New Brunswick, N. J.
POSSIBLE MECHANISM OF RETENTION IN HIGH PERFORMANCE LIQUID CHROMATOGRAPHY STUDIES OF COBALT COMPLEXES Ph.D. Thesis
John Francis McCaffrey 1981 98 p
Avail: Univ. Microfilms Order No. 8119130

A possible retention mechanism for the separation of several isomers of cobalt III complexes using reverse phase ion pair liquid chromatography is elucidated. The hydrophobic ion pairing reagent modifies the surface of the octadecylsilane stationary phase in such a way that the ionic portion of the ion pairing reagent protrudes out into the modile phase, while the hydrophobic portion is positioned toward the stationary phase. Due to this positioning of the ion pair reagent, a layer of counterions are preferentially concentrated along this surface; thus setting up a potential layer which will in turn bind the cationic cobalt complexes in a nonspecific way. Specific interactions between this aniomic

layer and the cobalt complexes lead to a separation of the cis and trans isomers. By varying the length and type of ion pair reagent in a systematic way as well as the counterion used, recognizable trends are observed which substantiates the proposed retention mechanism. The factors which favor ion pair formation with modified stationary phase are also operative for ion pair formation in solution. However, there is an imperfect cancellation. Dissert. Abstr.

N82-10173 Indiana Univ., Indianapolis.
STUDY OF SEVERAL FUNDAMENTAL PROCESSES IN CHEMICAL ANALYSIS. 1: MEASUREMENT OF AEROSOL AND GAS VELOCITIES IN ANALYTICAL FLAMES. 2: DETERMINATION OF ATOMIC AND MOLECULAR FLUORESCENCE LIFETIMES USING A CROSS-CORRELATION APPROACH Ph.D. Thesis
Richard Eugene Russo 1981 308 p
Avail: Univ. Microfilms Order No. 8119076

The atomic distribution in flames has a direct relationship to sensitivity, precision, and working curve linearity in analytical flame spectrometry. This work examined two of the parameters responsible for the distribution of atoms in a flame: rise velocity of the flame gases and acceleration of sample droplets in the flame. For each study, sample was introduced into the flame as uniform, discrete droplets. The design and characterization of a new droplet generator for this sample introduction is presented. A new time-resolved measurement system was constructed, consisting of a synchronously pumped dye laser source annd opto-electronic cross-correlation detection network. The experimental system provided excellent time resolution, sensitivity, and accuracy compared to conventional methods. Background information on both the laser and detection system is included. Excited-state lifetimes of several molecular compounds in condensed phase were measured. Dissert. Abstr.

N82-10174 Texas A&M Univ., College Station.
HEAVY ION RUTHERFORD BACKSCATTERING SPECTROMETRY Ph.D. Thesis
Robert Timothy Sullins, III 1981 87 p
Avail: Univ. Microfilms Order No. 8118302

Theory predicts enhanced mass and depth resolution as well as greater sensitivity for RBS with heavy ions vs. protons or alphas. In this study the actual analytical capabilities of heavy ion RBS (HIRBS) were evaluated for several heavy ion beams. The optics of interest were: selectivity, i.e., the mass resolution, the profiling ability, i.e., depth resolution, and sensitivity, i.e., quantitative aspects. Dissert. Abstr.

N82-11009# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
EXPERIMENTAL INVESTIGATION OF A VAPORIZING COMBUSTION WITH DOUBLE COMBUSTION SPACES
In its Recent Selected Papers of NW Polytech. Univ., pt. 2 (FTD-ID(RS)T-0260-81-Pt-2) 28 Aug. 1981 p 371-387 refs Transl. into ENGLISH from Recent Selected Papers of NW Polytech. Univ., pt. 2 (Xian Shaanxi), 1979 (For primary document see N82-10996 01-99)
Avail: NTIS HC A18/MF A01

N82-11010# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
A VAPORIZING COMBUSTOR WITH DOUBLE COMBUSTION SPACES
Tang Ming, Zhu Huiling, and Du Qinfang *In its* Recent Selected Papers of NW Polytech. Univ., pt. 2 (FTD-ID(RS)T-0260-81-Pt-2) 28 Aug. 1981 p 388-411 refs Transl. into ENGLISH from Recent Selected Papers of NW Polytech. Univ., pt. 2 (Xian Shaanxi), 1979 (For primary document see N82-10996 01-99)
Avail: NTIS HC A18/MF A01

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N82-10175 Illinois Univ. at Urbana-Champaign.
THE PROPAGATION OF STRESS CORROSION CRACKS IN ALPHA-BRASSES Ph.D. Thesis
Dennis Vinton Beggs 1981 188 p
Avail: Univ. Microfilms Order No. 8119632

Observation of surface crack traces in commercial grade alpha-brasses tested in a tarnishing ammoniacal solution indicate that the transgranular cracks propagated discontinuously by the sudden appearance, in its entirety, of a fine crack extending several microns ahead of the previous crack tip. By periodically increasing the deflection, crack front markings were produced on the resulting fracture surfaces and these showed that the crack front at the free surface did not lag behind the overall crack front. This indicated that the discontinuous propagation of the crack trace was representative of the subsurface cracking. The intergranula crack trace appeared to propagate continuously at a relatively blunt crack tip. Load pulsing tests were also conducted to determine whether transgranular stress corrosion cracks propagated discontinuously and to compare values for the crack advance distance, and the time between advances, with those observed for the crack trace. Transgranular cracking is believed to occur by discontinuous mechanical fracture of an embrittled region around the crack tip. The specific mechanism of embrittlement is not understood. Intergranular cracking is believed to result from a different mechanism with cracking occurring via the film-rupture mechanism. Dissert. Abstr.

N82-10176 Carnegie-Mellon Univ., Pittsburgh, Pa.
COMPOSITION EFFECTS ON THE MICROSTRUCTURE AND CRACKING OF AUSTENITE STAINLESS STEEL WELDS Ph.D. Thesis
John Albert Brooks 1981 356 p
Avail: Univ. Microfilms Order No. 8118427

The solidification behavior, solid state transformations, phosphorus and sulfur impurity segregation are addressed as well as their relationship to weld hot cracking of austenitic stainless steel. The central experimental techniques used were transmission electron microscopy (TEM), light metallography (LM), and scanning transmission electron microscopy (STEM). Detailed STEM analysis was conducted on both primary-ferrite and primary-austenite solidified structures. The partitioning of both Cr and Ni and P and S impurities were studied for both solidification modes. Both TEM and STEM were used to study the nature of the solid state phase transformations which result in a wide range of ferrite morphologies. The degree of alloy partitioning during these transformations was of special interest since this point is central to microstructural interpretation. Dissert. Abstr.

N82-10177 Polytechnic Inst. of New York, Brooklyn.
AN INVESTIGATION OF DIFFUSION OF SILICON IN ALUMINUM AND DILUTE ALUMINUM ALLOY THIN FILMS Ph.D. Thesis
Narendra K. Garg 1981 222 p
Avail: Univ. Microfilms Order No. 8118870

Silicon was diffused along dc magnetron sputtered thin-film couples of aluminum and dilute aluminum alloys of induim, tin, bismuth and antimony at temperature of 400 C, 450 C, 500 C, 560 C, and the resulting concentrationpenetration profiles were analyzed by means of the electron microprobe analyzer. The solid solubility of silicon was found to agree with the reported value in the metallurgical literature for silicon in wrought aluminum. The silicon diffusivity was found to be substantially enhanced, however probably due to a high concentration of imperfections in the sputtered aluminum films. The values of the activation energies (Q) for diffusion of silicon in dilute aluminum alloys obtained were essentially the same as that of pure aluminum with the notable exception of the Al-0.013 at % In alloy. Thus the activation energies were more or less insentive to solute additions with the exception of indium. Transmission electron microscopic examination showed a large variation in grain size distribution. It was also found that sputtered films have a very coarse grain size. Dissert. Abstr.

N82-10178 Carnegie-Mellon Univ., Pittsburgh, Pa.
THE EFFECT OF SLIP CHARACTER ON LOW CYCLE FATIGUE BEHAVIOR Ta-Al ALLOYS Ph.D. Thesis
Hak-Min Kim 1981 234 p

Avail: Univ. Microfilms Order No. 8118437

The anisotropic nature of the hcp lattice and the presence of short range order of order precipitates are responsible for the different cyclic deformation behavio of Ti-Al alloys. Transmission electron microscopy studies of the cyclic deformation structures show that increasing aluminum contents and, in alloys containing more than approximately 10 at percent al, aging to produce coherent alpha sub 2 precipitates, causes not only the wavy to planar slip transition, but also the concentration of slip into fewer, more intense bands. Scanning electron microscopy studies of pre-polished surfaces and of the fatigue fracture surfaces show that different low cycle fatigue (LCF) performance in these Ti-Al alloys is mainly due to the different crack initiation sites which cause different fatigue crack initiation lives. That is, strain localization along the few slip bands in the high Al content alloys leads to earlier crack initiation along these slip bands and results in poorer LCF performance. This is in contrast to the non-localized alloys where crack initiation at grain boundaries is dominant. Dissert. Abstr.

N82-10179 Case Western Reserve Univ., Cleveland, Ohio.
RADIATION DAMAGE IN ORDERED ALLOYS ***Ph.D. Thesis***
Hsichang Liu 1981 163 p
Avail: Univ. Microfilms Order No. 8118628

Defect aggregation and order-disorder phenomena in gamma '-Ni3Al and beta -NiAl were investigated by high voltage electron irradiation at temperatures from 10 K to 810 K. Small defect clusters are created by irradiation even at 10 K, an the loop number density decreases but the size of loops increases with increasing irradiation temperature. With regard to order-disorder phenomena, the balance between radiation induced disordering and radiation enhanced ordering, which operate simultaneously during irradiation,determines the steady-state degree of order in an ordered alloy. NiAl, CoAl and NiGa still maintain a partially-ordered state even after irradiation at 10 K (150 K for NiGa) to 3 dpa. By contrast, FeAl and CoFe irradiation at 150 K to 1.2 dpa develop completely disordered states. This can be explained by the high ordering energies in NiAl, CoAl and NiGa, and the energetically favorable nature of correlated 'right' recombinations of radiation induced point defects. Dissert. Abstr.

N82-10180 Carnegie-Mellon Univ., Pittsburgh, Pa.
THE EFFECTS OF MICROSTRUCTURE AS AFFECTED BY HEAT TREATMENT AND PROCESSING ON THE FATIGUE CRACK GROWTH BEHAVIOR OF A METASTABLE BETA ***TITANIUM ALLOY Ph.D. Thesis***
Gail Louise Mackiewicz Ludtka 1981 257 p
Avail: Univ. Microfilms Order No. 8118441

The relationship between microstructural and near-threshold fatigue crack growth for Beta III (Ti-11.5 Mo-6 Zr-4.5 Sn) titanium has been investigated for omega and alpha-aged conditions in both laboratory and inert environments. The microstructural versatility of such metastable beta titanium alloys permits the attainment of quite different microstructural conditions while simultaneously maintaining a comparable yield strength level. Three different processing conditions were chosen. Two of these were of the same nominal chemistry while the third processing condition had a higher oxygen content in order to study chemistry effects. Quantitative transmission electron microscopy and quantitative optical metallography were utilized to determine the volume fractions of the phases present. Extensive fractographic observations and mechanical property data analysis have fully characterized this material for the conditions evaluated.
Dissert. Abstr.

N82-10181 Polytechnic Inst. of New York, Brooklyn.
PLANE STRAIN FRACTURE TOUGHNESS AND FATIGUE PROPERTIES OF THERMOMECHANICALLY TREATED 7075 ALUMINUM ALLOY Ph.D. Thesis
Weera Phlawadana 1981 334 p
Avail: Univ. Microfilms Order No. 8118890

The effectiveness of a thermomechanical treatment (TMT) developed to improve the tensile properties and stress corrosion cracking susceptibility of commercial grade 7075 Al Alloy wrought products were investigated by studying the plane strain fracture toughness and plane bending fatigue properties of the thermo-mechanically treated 7075 Al alloy sheet and thin plate. Cycles of load were exercised on each toughness specimen to determine the pop-in and crack arresting characteristics of differently treated materials and the effective crack length data was recorded. It revealed that the TMT treatment did not adversely affect the 7075 Al alloy; instead an improvement in plane strain fracture toughness and fatigue strength in the longitudinal direction were found. Further studies on the fracture surfaces of fatigue and toughness specimens were carried out under optical, scanning electron, and transmission electron microscopes. The studies let to the clarification and explanation of the dependence of fatigue and toughness on the microstructure of 7075-TMT Al Alloy.
Dissert. Abstr.

N82-10182 Virginia Polytechnic Inst. and State Univ., Blacksburg.
EFFECT OF HYDROGEN ON THE DEFORMATION AND FRACTURE OF HIGH AND LOW STRENGTH STEELS ***Ph.D. Thesis***
Jangannathan Murali 1980 296 p
Avail: Univ. Microfilms Order No. 8118703

The effects of hydrogen on the mechanical properties of high and low strength steels were determined with the aid of tensile, delayed failure, fatigue and fracture mechanics tests. Hydrogen diffusivity and solubility were determined by analysis of hydrogen outgassing and steady state permeation experiments to correlate embrittlement phenomena with the kinetics of hydrogen transport. The effect of traps on hydrogen solubility and diffusivity was also investigated. A unified mechanism that explains the seemingly contradictory experimental data is proposed. This mechanism explains hydrogen damage as due to a critical hydrogen concentration that causes hydrogen induced hardening which may result in further concentration increases and subsequent hydrogen induced decohesion. The relevancy of material and experimental variables in determining the necessary steps outlined in the unified mechanism for hydrogen embrittlement is discussed. Dissert. Abstr.

N82-10183 Case Western Reserve Univ., Cleveland, Ohio.
MECHANISMS OF SHRINKAGE CAVITY FORMATION DURING SOLIDIFICATION OF DUCTILE IRON Ph.D. Thesis
Prasanna Kumar Samal 1981 113 p
Avail: Univ. Microfilms Order No. 8118634

Metal and mold factors affecting the shrinkage behavior of ductile iron were investigated. The main variables included: metal composition; stability of the mold or mold binder (green sand and resin bonded molds were used); pouring temperature; methods of inoculation; and the surface area to volume ratio of the casting. Factors that increase mold cavity enlargement also increase the size of the shrinkage cavity. Mold cavity enlargement was greater for castings produced in regular green sand molds than for those cast in stronger molds of no-bake, alkyd resin bonded sand. The surface area to volume ratios of the bosses also influence the shrinkage behavior, since the Volume 2/Surface Area 2 ratio determines the time of solidification. The composition, temperature and the degree of nucleation of the molten ductile iron also influence the amount of shrinkage, although some of these effects occur because of their influence on mold wall movement. The effect of pouring temperature was relatively small. Dissert. Abstr.

N82-10184 Texas Univ. at Arlington.
THE ELLIPSOMETRIC CHARACTERIZATION OF METAL SEMICONDUCTOR INTERFACES Ph.D. Thesis
Shiuh Chao 1981 110 p
Avail: Univ. Microfilms Order No. 8119271

An optical model for the Co/Si inerface reaction was formulated by means of ellipsometry. The formation of a glassy Si layer, followed by nucleation of Co2Si phase at the initial stage of Co deposition was postulated and observed through transport and transmission electron diffraction measurement. Multiple angle of incidence ellipsometry ws used here to study the Co/Si interface for varying Co deposition thickness. The refractive index of the surface layer increases as Co is first deposited, then decreases sharply in the vicinity of the Co deposition where discontinuity in the psi-Delta curve was well as a semiconducting-metallic electrical transition were observed. The increased refractive index is characteristic of an amorphoutized Si region. A phenomonological model of a local-delocal electronic phase transition is employed to account for the sharp decrease

of refractive index that appears to immediately precede the semiconducting-metallic transition which triggers the subsequent Co2Si nucleation. Dissert. Abstr.

N82-10185 Carnegie-Mellon Univ., Pittsburgh, Pa.
MECHANISMS OF EROSIVE WEAR OF DUCTILE METALS DUE TO THE LOW VELOCITY, NORMAL INCIDENCE, IMPACT OF SPHERICAL PARTICLES Ph.D. Thesis
Paul Stoner Follansbee 1981 237 p
Avail: Univ. Microfilms Order No. 8118433

The normal incidence impact of spherical particles with a ductile target was investigated because of interest in coal conversion processes. A simple, cumulative damage model is proposed to describe erosive wear in these conditions. The penetration of a rigid, spherical body into an elasto-plastic substrate is analyzed using a finite element code, and from this analysis the location and magnitude of the plastic strain reversals occurring under multiple impacts is inferred. These plastic strain reversals are then used in conjunction with a Coffin-Manson law to furnish a prediction of relative erosion rates for different velocities and materials. An experimental simulation of erosion under these conditions is also presented with the erosion rates for Cu and Cu-Al alloys being measured in terms of weight loss for a range of low velocities. The surfaces, subsurface regions, and wear debris from eroded test specimens are characterized microscopically. Confirmation of the cumulative damage model is provided by the complimentary nature of the detailed stress/strain distributions determined analytically, and the experimental surface characterizations, and by the agreement, over a wide range, of predicted and measured relative, steady-state, erosion rates. Dissert. Abstr.

N82-10186 Wisconsin Univ. - Madison.
THE UPPER CRITICAL FIELD AND HIGH FIELD CRITICAL CURRENT DENSITY OF NIOBIUM-TITANIUM AND NIOBIUM-TITANIUM BASED ALLOYS Ph.D. Thesis
David George Hawksworth 1981 303 p
Avail: Univ. Microfilms Order No. 8115993

Investigations of the effect of ternary alloying additions of V, Ta, Sn, and Al on the upper critical field of Nb-Ti alloys between 2 K and the critical additions of the heavy elements Hf and Ta enhance the low temperature upper critical field, but additions of Al, Sn, and V reduce the upper critical field at all temperatures. The reasons for these differences in behavior were investigated through measurements of the critical temperature, the normal state resistivity, and the electronic specific heat coefficient. Significant enhancements found in the upper critical field of Nb-Ti-Ta alloys at 2 K are described. By carefully measuring the critical current density of four commercially available Nb-Ti multifilamentary composites, it is shown how the enhancements translate into improved high field performance of Nb-Ti at fields close to the upper critical field. The critical current density (12 Tesla, 2 K) value for a Nb 65a/oTi 10a/o Ta (Nb 43w oTi 25W/ o/Ta) alloy is predicted. Dissert. Abstr.

N82-10187 Virginia Univ., Charlottesville.
STRENGTH OF POLYCRYSTALLINE, CHROMIUM CONTAINING STEEL WHISKERS AFTER ANNEALING Ph.D. Thesis
Thomas Matthew Moore 1981 150 p
Avail: Univ. Microfilms Order No. 8117915

Because alloying iron polycrystalline whiskers with 2.5 percent chromium results in a retention of most of their original strength after brief heat treatments characteristics of the incorporation of these fibers into a metal matrix composite, chromium-alloyed whiskers were produced over the entire composition range, heat-treated in the range of 400 to 800 C, analyzed for composition, and tested for microhardness. The whiskers show a broad variation in chromium content within any production experiment due to the apparent lower decomposition temperature of chromium carbonyl and the retention of the original hardness is seen in whiskers of approximately 65 percent chromium. Whiskers of higher chromium content show a significant increase in hardness after heat-treatment. This high temperature strength is attributed to he sintering of a loosely bonded Cr2O3 structure. The presence of oxygen in the whiskers is associated with the deposition of chromium. Insights into the growth and microstructure of the whiskers were gained. Dissert. Abstr.

N82-10188 Utah Univ., Salt Lake City.
THERMOMECHANICAL TREATMENTS OF STEEL AND FATIGUE RESISTANCE Ph.D. Thesis
Po-We Kao 1981 154 p
Avail: Univ. Microfilms Order No. 8116770

The fatigue behavior of thermomechanically treated (TMT) pearlitic steels was studied with the fatigue initiation phase. The rapid annealing treatment was investigated by using scanning electron microscopy (SM), positron Doppler broadening, X-ray line broadening, and hardness. Fatigue initiation tests were carried out on eight selected microstructures, which included the following variables: interlamellar spacing, hardness, grain boundary proeutectoid ferrite network, ferrite crystallographic texture, and orientation of cementite lamellae and inclusions. Following fatigue-crack-initiation, fatigue-crack propagation was studied using single-edge-notched (SEN) specimens. Boron ion implantation was applied to further increase the already improved fatigue resistance of thermomechanically treated eutectoid steel. An approach to microhardness interpretation is advanced which is capable of quantifying the strengthening effect of hardened layers which may only be one to two microns thick. Correlation is established between total fatigue life and this microhardness analysis. Dissert. Abstr.

N82-10189 Wisconsin Univ. - Madison.
RADIATION INDUCED ORDER-DISORDER TRANSFORMATION Ph.D. Thesis
Ralph Hing-Chung Zee 1981 220 p
Avail: Univ. Microfilms Order No. 8116685

A model for ordered alloys is presented which describes the combined effects of radiation disordering and radiation enhanced-ordering. The model uses the assumptions of Bragg and Williams ordering in a kinetic form. Point defect concentrations are introduced into the kinetics so that the effect of radiation enhanced diffusion can be described. Both time dependent and steady state solutions are presented. CuPd ordered alloy of 52:48 atomic percent composition was irradiated using 14 MeV copper ions, 14.8 MeV neutrons and 1.8 MeV electrons. A post-irradiation annealing up to 310 C was conducted on two radiation disordered samples. This result indicates that the reordering process is heterogeneous in nature similar to classical recrystallization. Results of the 1.8 MeV electron irradiation at 80 K on an ordered CuPd sample gave a replacement to displacement ratio of 2.5. Annealing the irradiated sample at temperatures above 23 C resulted in recoveries of over 100 percent. Dissert. Abstr.

N82-10190 Texas Univ. at Arlington.
MECHANISMS OF GASEOUS ENVIRONMENTAL EMBRITTLEMENT DURING FATIQUE CRACK GROWTH IN ALUMINUM ALLOYS Ph.D. Thesis
Anna Krystyna Debogorska Zurek 1981 158 p
Avail: Univ. Microfilms Order No. 8119404

The diffusion and transport of deuterium and oxygen during fatigue crack growth of 2000 and 7000 series aluminum alloys were studied with SIMS and AES techniques for samples fatigued in vacuum, D2O,H2O, is O2-(18) and D2. Dry gases were found to have no influence on the crack propagation rates in aluminum alloys, while water vapor was found to enhance the crack propagation rates. Significant differences in penetration depth of deuterium was found between samples fatigued in dry gases to that fatigued in water vapor. The dependence of he deuterium diffusion on the presence of different trapping sites was studied using variety of deuterium ion implanted surfaces. The deuterium profiles of D2O vapor fatigue fractured specimens were closely duplicated in the deuterium ion implantation experiment. It is suggested that surface oxide serves as a strong trap and a barrier for the outdiffusing deuterium. Dissert. Abstr.

N82-10191 California Inst. of Tech., Pasadena.
THEORETICAL STUDIES OF HOMOGENEOUS CATALYSIS BY TRANSITION METAL COMPLEXES Ph.D. Thesis
Anthony Kay Rappe 1981 137 p
Avail: Univ. Microfilms Order No. 8118920

Extensive ab initio calculations (double zeta plus polarization function basis with correlated wavefunctions) on the oxidation of hydrocarbons by chromyl chloride are combined with standard thermochemical methods to predict the energetics for oxidation of alkanes, alcohols, and alkenes. Additional results are presented

on the analogous oxidations by molybdyl chloride. A common feature of all these reactions is identified and explained. Calculations (double zeta plus polarization function basis with correlated wavefunctions) on the olefin metathesis reaction with high valent Mo and W catalysts are combined with standard thermochemical methods to predict the energetics of potential intermediates. The active catalyst is identified and explained together with several subsidiary features of the reaction manifold. A unifying generalized valence bond view of transition metal ligand bonding is presented as well as the energetics and structural characteristics of several ligand types. Additionally, the energetics for several ligand exchange reactions of potential synthetic utility are presented. Dissert. Abstr.

N82-10192 Pennsylvania Univ., Philadelphia.
REACTIONS OF ALKALINE EARTH METALS WITH VIBRATIONALLY EXCITED HYDROGEN HALIDES Ph.D. Thesis
Afranio Torres-Filho 1981 205 p
Avail: Univ. Microfilms Order No. 8117866

A double molecular beam chamber was designed and built to study reactive scattering processes. The reactions involved alkaline earth metals, M, (M = Ca, Sr, Ba) with vibrationally excited HF molecules. For the reactions of Ba + HF(v) yields BaF(v') + H, the mean product vibrational energy increases from 1.5 kcal to 5.4 kcal to 8.0 kcal for v = 0, 1, and 2, respectively, corresponding to 21%, 30% and 28% of the total energy content of the process. For the reaction of Sr + HF(v) yields SrF(v') + H, the total cross section is zero for reactions with v' = 0, and for reagents at v' = 2, the relative cross sections represent an average vibrational energy content of 3.7 kcal. In the case of Ca + HF(v = 2) no new states of CaF were formed although about 6 new vibrational levels were energetically accessible. Preliminary results on the reactions of Ca, Sr and Ba with vibrationally excited HCl,(v = 1,J = 3), are also presented. Dissert. Abstr.

N82-10193*# IIT Research Inst., Chicago, Ill. Materials Technology Div.
THERMAL FATIGUE AND OXIDATION DATA OF TAZ-8A AND M22 ALLOYS AND VARIATIONS Technical Report, 1 Feb. - 30 Apr. 1980
K. E. Hofer and V. E. Humphreys Sep. 1981 44 p refs
(Contract NAS3-17787)
(NASA-CR-165407; IITRI-M06001-89) Avail: NTIS HC A03/MF A01 CSCL 11F

Thermal fatigue and oxidation data were obtained on 36 specimens, representing 18 distinct variations (including the base systems) of TAZ-8A and M22 alloys. Double-edge wedge specimens for these systems were cycled between fluidized beds maintained at 1088 C and 316 C with a 180 s immersion in each bed. The systems included alloys TAZ-8A, M22, and 16 variations of these alloys. Each alloy variation consisted of a unique composition with an alternation in the percentage of carbon (C1 and C2), molydenum (M1 and M2), tungsten (W1 and W2), columbium (CB1, CB2, and CB3), tantalium (T1, T2, and T3), or boron (B1, B2, and B3) present. All of the alloys showed little weight change due to oxidation compared with other alloys previously tested in fluidized beds. Only both C1 alloy variation specimens survived 3500 cycles without cracking in the small radius, although substantial cracks were present, emanating from the end notches which were used for holding the specimens. Author

N82-10194*# Clemson Univ., S.C. Dept. of Mechanical and Materials Engineering.
FURTHER STUDY OF NEAR SOLIDUS INTERGRANULAR CRACKING IN INCONEL 718 Final Report
Raymond G. Thompson 17 Sep. 1981 30 p refs
(Contract NAS8-33805)
(NASA-CR-161878) Avail: NTIS HC A03/MF A01 CSCL 11F

A series of tests, performed to determine the strain necessary to initiate intergranular cracking in Inconel 718 as a function of temperature, contained enough scatter near the melting temperature that questions remained as to the best curve of curves to fit to the data. Fracture surface analysis showed that the scatter was due to incipient melting in the grain boundary region. The melting contributed to low fracture strain but had only a small on the incipient cracking strain. Gleeble tests, which could be interrupted by water quenching, were used to study the incipient intergranular melting of Inconel 718. This modified weld simulation test provided a sufficiently rapid quench to preserve the intergranular microstructure created during incipient melting. This structure was studied both microscopically and with energy dispersive X-ray analysis. The implications of incipient melting and low-strain incipient cracking on the development of microfissuring envelopes are discussed. A.R.H.

N82-10195*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio
CREEP SHEAR BEHAVIOR OF THE OXIDE DISPERSION STRENGTHENED SUPERALLOY MA 6000E
Thomas K. Glasgow 1981 19 p refs Presented at 110th Ann. Meeting of the Am. Inst. of Mining, Met. and Petroleum Engr., Chicago, 22-26 Feb. 1981
(NASA-TM-82704; E-985) Avail: NTIS HC A02/MF A01 CSCL 11F

The shear rupture life of the oxide dispersing strengthened (ODS) superalloy MA 6000E was determined at 650 and 760 C was 250 MPa. Comprisons were made at 760 C with the conventional cast superalloy B-1900+Hf, the ODS alloy MA 754, and the directionally solidified eutectic alloy gamma/gamma prime-delta was 170 MPa, and for B-1900+Hf was 360 MPa. The ODS alloy MA 6000E and gamma/gamma prime-delta failed with very little indication of ductile accommodation. Both MA 754 and B-1900+Hf showed some ductile tearing. Fracture surfaces of the ODS alloy MA 754 showed discontinuities similar size, shape, and roughness to its grain structure, but the fracture surfaces of MA 6000E were much smoother than its grain boundaries. Author

N82-10196# Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Materials Engineering.
LIQUID METAL AND HYDROGEN EMBRITTLEMENT OF NICKEL AND IRON-BASE AMORPHOUS ALLOYS Technical Report, 15 Sep. 1980 - 1 Sep. 1981
S. Ashok, T. Slavin, Norman S. Stoloff, and M. E. Glicksman 1 Sep. 1981 13 p refs
(Contract N00014-79-C-0583)
(AD-A103047; TR-2) Avail: NTIS HC A02/MF A01 CSCL 11/6

Tensile and bend properties of nickel and iron-base amorphous alloys have been studied at 200 C in the presence of liquid lithium and in air. Nickel base alloys show severe embrittlement, except for Metglas 2826MB. The results are discussed on the basis of proposed mechanisms of LME and it is concluded that the embrittlement of amorphous alloys takes place by an enhanced shear mechanism. Hydrogen embrittlement also seems to occur by a similar process. Author (GRA)

N82-10197# Oakland Univ., Rochester, Mich. Dept. of Chemistry.
THE ELECTROGENERATION OF SOLVATED METAL ATOMS. 1: THE FAR INFRARED SPECTRUM OF SOLVATED LITHIUM
P. P. Schmidt and B. S. Pons 1 Aug. 1981 29 p refs Submitted for publication Prepared in cooperation with Alberta Univ., Edmonton
(Contract N00014-77-C-0293; NR Proj. 359-648)
(AD-A103996; TR-9) Avail: NTIS HC A03/MF A01 CSCL 07/2

In some instances, the electrodeposition of metals onto electrodes may involve the prior generation of solvated metal atoms in the region of the outer Helmholtz plane. As a consequence, recently developed spectroscopic methods for detecting species in the interfacial region may be used to observe the solvated metal atoms. Therefore, with this paper we initiate an investigation of the nature of the possible states of solvation for these species in order to try to predict parameters which would be critical to their identification. In this paper we estimate the frequency at the band maximum for the far infrared-active vibrations which we predict to exist for the solvated lithium atom. We argue that the forces of repulsion may be nearly the same for the cation and atom. Thus, by means of a comparison to the Morse potential, we identify parameters for that potential.

We determine the magnitude of the force constant for the vibrations of the atom in its cage of solvent. GRA

N82-10198# Southwest Research Inst., San Antonio, Tex.
STUDY AND MODELING OF HIGH-TEMPERATURE-FATIGUE CRACK PROPAGATION IN AUSTENITIC STAINLESS STEEL Progress Report, 1981
D. L. Davidson 1 Aug. 1981 32 p refs
(Contract DE-AS05-79ER-10475)
(DE81-028941; DOE/ER-10475/2) Avail: NTIS HC A03/MF A01

Crack tip plasticity in stainless steels was examiner as a function of the variables: stress intensity factor, temperature, environment, frequency, and under creep and fatigue conditions. Interim results of crack tip plasticity determinations in 304 stainless steel with some of the variables are presented. DOE

N82-10199# International Nickel Co., Inc., Suffern, N. Y. Research and Development Center.
EVALUATION OF THE EFFECTS OF HEAT TREATMENT ON THE PASSIVE BEHAVIOR OF Ni-Cr-Fe ALLOYS IN HIGH TEMPERATURE WATER
P. E. Morris Jun. 1981 206 p refs Sponsored by Electric Power Research Inst.
(EPRI Proj. 1170-1)
(DE81-903816; EPRI-NP-1884) Avail: NTIS HC A10/MF A01

Five electrochemical test programs were completed to investigate the effects of thermal treatment, environmetal variations and stress on the corrosion resistance of INCONEL alloys 600 and 690 in PWR related dilute caustic environments in the temperature range between 260 to 3160 C. Several of the tested specimens were selected to characterize the corrosion product surface scales. The fundamental electrochemical corrosion behavior of these systems is described and a possible mechanism of surface scale formation is discussed. One test program was conducted to investigate the stress corrosion resistance of INCONEL alloys 600 and 690 in recirculated water containing 0.2 ppM oxygen at 2890 C. In addition to stress corrosion test results, the effects of dissolved oxygen on the corrosion potential are presented. DOE

N82-10200# Bendix Corp., Kansas City, Mo.
CVD TUNGSTEN-RHENIUM ALLOY CORROSION BEHAVIOR
D. E. Engelhaupt Aug. 1981 41 p refs
(Contract DE-AC04-76DP-00613)
(BDX-613-2477) Avail: NTIS HC A03/MF A01

The chemical and electrochemical corrosion behavior of chemical vapor deposited tungsten-rhenium alloy has been studied using nitric and sulfuric acid mixtures to remove the deposition substrate. The alloy corrosion rates as a function of acid compostion, aeration and temperature were established. Computer-aided analysis of polarization data showed that the tungsten-rhenium etched faster in dilute nitric acid solutions. The logarithmic etch rate was proportional to the reciprocal of the etchant temperature. Selective etching of the surface was more severe for alloys with an excess of eighteen weight percent rhenium. Protective coatings were studied and their respective merits are considered. DOE

N82-10201# Idaho National Engineering Lab., Idaho Falls.
CORROSION TESTING OF CARBON STEEL IN AEREATED GEOTHERMAL BRINE
D. F. Suciu and P. M. Wikoff Idaho Falls, Idaho Edgerton, Germeshausen and Grier, Inc. Feb. 1981 55 p refs
(Contract DE-AC07-76ID-01570)
(DE81-028653; EGG-GTH-5474) Avail: NTIS HC A04/MF A01

Two major problems are associated with the use of cooled geothermal water as coolant for the 5 MW(e) Pilot Power Plant and Raft River are: a scaling potential owing to the chemical species present in solution, and the corrosive nature of the geothermal water on carbon steels. A water treatment test program was established to reduce or eliminate these problems. Data show that scale can be prevented by a combination of dispersants and controlling the concentration of scaling species in the circulating water. Corrosion cannot be controlled without a pretreatment of tubing material. With the pretreatment, a protective gamma iron oxide film is laid down on the tube surface, that with proper corrosion inhibitor additives, significantly reduces both general and pitting corrosion. However, longer term testing is required to determine protection of pitting corrosion. DOE

N82-10202# Purdue Univ., Lafayette, Ind. School of Materials Engineering.
ZERO-FLUX PLANES AND FLUX REVERSALS IN MULTICOMPONENT DIFFUSION Progress Report, 1 Jan. - 31 Aug. 1981
M. A. Dayananda Aug. 1981 38 p
(Contract DE-AC02-81ER-10814)
(DE81-028526; DOE/ER-10814/1) Avail: NTIS HC A03/MF A01

The development and role of the zero-flux planes (ZFP) and flux reversals in both single phase and multiphase diffusion couples in the Cu-Ni-Zn and Fe-Ni-Cr ternary system was explored. Both single phase and multiphase diffusion couples were assembled with (alpha)(fcc) and/or (beta)(bcc) Cu-Ni-Zn alloys with similar thermodynamic activities of either Cu, Ni, or Zn and diffusion annealed at 775 C. The ZFP's where the interdiffusion flux of one of the components goes to zero were identified in several couples. The ZFP compositions were found to correspond through the terminal alloys on an isotherm. Similar studies of interdiffusion were done with (gamma)(fcc) Fe-Ni-Cr alloys at 1100 C for the determination of interdiffusion coefficients and diffusional interactions. In the third project, preliminary sandwich couples where two ZFP's move towards each other were set up with selected Cn-Ni-Zn alloys at 775 C for studies of possible ZFP interaction and regulation of interdiffusion fluxes. DOE

N82-10203# General Atomic Co., San Diego, Calif.
FATIGUE-LIFE PREDICTION FOR COPPER ALLOY DEGRADED BY MULTIPLE FLAWS
R. A. Sweig Jul. 1981 58 p refs Sponsored in part by Japan Atomic Energy Research Inst.
(Contract DE-AT03-80SF-11512)
(DE81-029949; GA-A-16144) Avail: NTIS HC A04/MF A01

Fatigue life prediction for alloy 155 copper degraded by multiple flaws was established. Twelve specimens with natural flaws were radiographically characterized and fatigue tested to failure in a manner which minimized data scatter. Disposition of defective alloy 155 copper plate stock and doublet 3 B-coil machined center post components was based on radiographically determined flaw size. Along with the macroscopic vertical internal flaws detected by radiography, undetectable microscopic alloy segregations wre present in the microstructure. Data scatter, including microscopic flaw distribution, was related to radiographically detectable flaw size, and the reliability of the radiographic method was evaluated. B-coil fatigue lives for various load conditions were predicted. B-coil life expended to date and useful life remaining are discussed. DOE

N82-10204# Oak Ridge National Lab., Tenn. Metals and Ceramics Div.
THERMAL AGING BEHAVIOR OF ERNiCr-3 ALLOY (WELD AND BASE METAL)
R. L. Klueh and J. F. King Aug. 1981 36 p refs
(Contract W-7405-eng-26)
(DE81-027047; ORNL-5783) Avail: NTIS HC A03/MF A01

The nickel-base filler metal alloy ERNiCr-3, containing nominally 67% Ni, 20% Cr, 3% Fe, 3% Mn, and 2.5% Nb, is used widely to make welds for elevated-temperature service. To determine the effect of elevated temperature on tensile and creep-rupture properties of ERNiCr-3, weld metal specimens were thermally aged to 10,000 h at 5100 C, to 15,000 h at 5660 C, and to 1000 h at 6700 C. Wrought ERNiCr-3 was also aged at 566 and 6770 C. The 0.2% yield strength of the ERNiCr-3 weld metal increased with thermal aging time at 510 and 5660 C. The ultimate tensile strength also increased continuously with aging time at 5660 C, whereas at 5100 C, it went through a maximum (the strength of the material aged 10,000 h was less than was that aged 5000 h). DOE

N82-10205# Oak Ridge Y-12 Plant, Tenn. Metals and Ceramics Dept.

HYDROGEN CONTENT AND STRAIN RATE EFFECTS ON THE TENSILE PROPERTIES OF A URANIUM-TITANIUM ALLOY

W. G. Northcutt, Jr., G. L. Powell, and T. C. Myhre 28 Apr. 1981 10 p refs Presented at the Conf. on High Density Penetration Materials, Charlottesville, Va., 28 Oct. 1980 Sponsored in part by Army ARRADCOM, Dover

(Contract W-7405-eng-26)

(DE81-024092; Y/DV-74; CONF-801061-8) Avail: NTIS HC A02/MF A01

Hydrogen embrittlement of U-0.74Ti alloy occurred below 1 H2 in specimens tested at 10 to the -4 power/s. At a higher strain rate of 1 S, however, the alloy experienced a much less embrittling effect out to approximately 8 wppm H2. Hydrogen content in the alloy did not affect properties other than elongation and reduction-in-area. Strength properties were increased by the higher strain rate. A second alloy of U-0.74Ti with increased iron content (from 20 to 50 wppM) was also tested at the high strain rate for the effect of hydrogen content on tensile properties. No differences in properties could be detected in the high strain rate results due to iron content. DOE

N82-10206# Oak Ridge Y-12 Plant, Tenn. Metals and Ceramics Dept.

EFFECT OF TITANIUM CONTENT AND AGING TEMPERATURE ON THE PROPERTIES OF URANIUM-TITANIUM ALLOYS

W. G. Northcutt, Jr. 28 Apr. 1981 16 p refs Presented at the Conf. on High Density Penetration Materials, Charlottesville, Va., 28 Oct. 1980 Sponsored in part by Army ARRADCOM, Dover

(Contract W-7405-eng-26)

(DE81-024091; Y/DV-73; CONF-801061-7) Avail: NTIS HC A02/MF A01

The mechanical properties and microstructures of four uranium-titanium alloys were examined as functions of titanium content and aging temperature. Titanium alloy content was varied from 0.41 to 0.79 weight percent. Aging temperatures from 350 to 460 C (all for six hours) were evaluated for each alloy in addition to tests in the unaged conditions. Titanium and aging temperature were both shown to be strong effects in determining alloy properties. It was determined that the uranium-0.41 weight percent titanium alloy underwent extensive age-hardening even though the alloy did not exhibit a martensitic microstructure characteristic of the alloys richer in titanium. DOE

N82-10207# Sandia Labs., Albuquerque, N. Mex.

THERMAL-VISCOUS MODEL FOR HETEROGENEOUS YIELDING IN ALUMINUM

D. B. Hayes and D. E. Grady 1981 10 p refs Presented at the APS Conf. on Shock Waves in Condensed Matter, Menlo Park, Calif., 23 Jun. 1981

(Contract DE-AC04-76DP-00789)

(DE81-023748; SAND-81-0108C; CONF-810684-3) Avail: NTIS HC A02/MF A01

The finite rise times of high intensity shock waves in metals are commonly interpreted in terms of a bulk viscosity which is observed to vary inversely as the square root of the strain rate. To interpret this result, a two-temperature thermal model of a heterogeneously-yielding metal was constructed. The model assumes that the body is composed of thin shear bands in which irreversible energy is dissipated as heat and which are separated by the bulk of the material which undergoes isentropic compressive heating only. A condition of wave steadiness quantifies the irreversible energy dissipated during the passage of the shock. Two important results follow: first, the dependence of the apparent viscosity on the inverse square root of the strain rate stems from the microstructural, heterogeneous nature of the process, and is only expected for steady waves; second, when the model is used to interpret recent experiments, the viscosity calculated in the shear band itself is seen to be temperature independent. DOE

N82-10208# Argonne National Lab., Ill. Materials Science Div.

INTRODUCTION TO HYDROGEN IN ALLOYS

D. G. Westlake New York City Plenum Publishing Corp. 1980 33 p refs Presented at the Adv. Study Inst. on Metal Hydrides, Rhodes, Greece, 17-27 Jun. 1980

(Contract W-31-109-eng-38)

(CONF-8006130-3) Avail: NTIS HC A03/MF A01

Substitutional alloys, both those that form hydrides and those that do not, are discussed, with more emphasis on the former. Topics covered include: (1) the significant effects of substitutional solutes on the pressure-composition-temperature (PCT) equilibria of metal-hydrogen systems; (2) the changes in thermodynamic properties resulting from differences in atom size and from modifications of electronic structure; (3) attractive and repulsive interactions between H and solute atoms and the effects of such interactions on the pressure dependent solubility for H; (4) H trapping in alloys of Group V metals and its effect on the terminal solubility for H (TSH); (5) some other mechanisms invoked to explain the enhancement (due to alloying) of the (TSH) in Group V metals; and (6) H impurity complexes in alloys of the metals Ni, Co, and Fe. Some results showing that an enhanced TSH may ameliorate the resistance of a metal to hydrogen embrittlement are presented. DOE

N82-10209# Argonne National Lab., Ill. Materials Science Div.

OBSERVATIONS ON GRAIN-BOUNDARY STRUCTURES IN NICKEL OXIDE

K. Y. Liou and N. L. Peterson 1980 12 p refs Presented at the 7th LLR/MMRD Intern. Symp. of Interfaces in Glass Metal Systems, Berkeley, Calif., 28 Jul. 1980

(Contract W-31-109-eng-38)

(DE81-023125; CONF-800765-10) Avail: NTIS HC A02/MF A01

Transmission electron microscopic analysis of dislocation networks at low angle boundaries in nickel oxide annealed (1,500 C) to reach equilibrium is discussed as the structure of (001) twist boundaries near special coincidence angles in nickel oxide bicrystals prepared by a pressure sintering technique. DOE

N82-10210# Rockwell International Science Center, Thousand Oaks, Calif.

REMAINING FATIGUE LIFETIME PREDICTION FOR RETIREMENT-FOR-CAUSE IN ALUMINUM ALLOYS

W. L. Morris, M. R. James, and O. Buck (Ames Lab., Iowa) 1980 13 p refs Presented at the Symp. on NDE, Pittsburgh, 5-9 Oct. 1980

(Contract W-7405-eng-82)

(DE81-023756; IS-M-315; CONF-8010190-1) Avail: NTIS HC A02/MF A01

A methodology is evaluated for predicting the probability of specimen failure with subsequent fatigue, following detection of a short surface crack in an Al 2219-T851 alloy. Cracks are detected and tracked to failure using optical microscopy. Predictions of the distribution in remaining lifetimes, for comparison with measured values, are made with a Monte Carlo procedure in conjunction with crack growth laws that model the effect of grains of differing size, shape and crystallographic orientation on the propagation rate. A slower average rate of crack growth for cracks formed later during fatigue is observed and predicted. DOE

N82-10211# Oak Ridge National Lab., Tenn. Chemical Technology Div.

SORPTION OF IODINE ON LOW-CHROMIUM-ALLOY STEEL

M. F. Osborne, R. B. Briggs, and R. P. Wichner 1981 7 p refs Presented at the Ann. Meeting of the Am. Nucl. Soc., Miami Beach, Fla., 7-12 Jun. 1981

(Contract W-7405-eng-26)

(DE81-023271; CONF-810606-52) Avail: NTIS HC A02/MF A01

The sorption behavior of iodine on the surfaces of 1 1/4% Cr-1% Mo steel was investigated as a part of the high temperature gas cooled reactor (HTGR) chemistry program. In an effort to determine the equilibrium sorptive capacity of this alloy, which ccomprises most of the cooler regins of HTGR coolant circuit, under representative conditions. The data obtained are to be used to improve the capability for predicting, with computer programs, iodine deposition as functions of temperature and location in the primary circuit. DOE

N82-10212# Fraunhofer-Inst. fuer Betriebsfestigkeit, Darmstadt (West Germany).
DESIGN RELEVANT MATERIAL DATA FOR SINTERED ALLOYS
C. M. Sonsino 1981 181 p refs In GERMAN; ENGLISH summary
(LBF-LB-158-1981) Avail: NTIS HC A09/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 75

Mechanical fracture and fatigue tests were carried out with porous sintered alloys Fe Cu C and Fe Cu Ni. These tests show that conventional material data do not permit an aimed material selection and component design. Cyclic stress-strain curves, crack-propagation and fracture-toughness data as well as statistically evaluated S-N curves indicate, that pores with their effect as internal notches assure better fatigue properties than expected. Their scatter is not larger than for wrought steels. With constant alloy content the mean values depend significantly on the density. Author (ESA)

N82-10213*# National Bureau of Standards, Boulder, Colo. Thermophysical Properties Div.
LASER-INITIATED COMBUSTION STUDIES OF SELECTED ALUMINUM, COPPER, IRON, AND NICKEL ALLOYS
James W. Bransford and Alan F. Clark Apr. 1981 90 p
(Contract NASA Order H-43201-B)
(PB81-215501; NBSIR-81-1647) Avail: NTIS HC A05/MF A01 CSCL 11F

The results of combustion studies at atmospheric pressure on ten metal alloys are presented. The alloys studied were aluminum alloys 1100, 2219, 6061, and tensile-50; 304, 347 and 21-6-9 stainless steel; inconel 600; beryllium copper and a bronze. It was found that once ignition was achieved all alloys would generally burn to completion. The overall combustion process appears to obey a first order rate process. Preliminary conclusions are presented along with recommendations for future work. GRA

N82-10214 Carnegie-Mellon Univ., Pittsburgh, Pa.
SMALL HOMONUCLEAR CLUSTERS OF BERYLLIUM AND BORON Ph.D. Thesis
Robert Alfred Whiteside 1981 118 p
Avail: Univ. Microfilms Order No. 8118449

The results of ab initio molecular orbital calculations on the structures and energies of small elemental clusters of beryllium and boron are described. Corrections are made for electron correlation using Moller-Plesset perturbation theory through fourth order in some cases. Included are beryllium clusters up to Be, and boron clusters up to B6 (excluding B5), and several structures are examined for each. Dissert. Abstr.

N82-10215 New Hampshire Univ., Durham.
THE KINETICS OF DISSOCIATION OF FIVE-COORDINATE TRANSITION METAL COMPLEXES IN NONAQUEOUS AND MIXED MEDIA Ph.D. Thesis
Nancy Lou Gottke 1980 84 p
Avail: Univ. Microfilms Order No. 8118541

Five-coordinate complexes of nickel (II), cobalt(II), and copper (II), were prepared from the quadridentate ligand tris-(2-dimenthylaminoethyl)amine, a ligand which forms high-spin trigonal bipyramidal complexes. Previous studies of the dissociation of these complexes in aqueous perchloric acid revealed a single step kinetic process. Dissociation of the cobalt(II) complex was undertaken in acetonitrile, in dimethyl sulfoxide, and in N,N-dimethylformamide, with monochloroacetic acid as the dissociating agent. Multi-step kinetic behavior was observed. The rate-determining step was considerably faster in dimethyl sulfoxide and in N,N-dimethylformamide than in acetonitrile and in water. Possible mechanisms for the dissociation reaction are described and discussed in terms of solvent properties and crystal field energies. Further studies were undertaken in mixed solvents such as dimethyl sulfoxide/water and N,N-dimethylformamide/water mixtures, to determine the effect of the presence of water on the mechanism of the dissociation reaction. Dissert. Abstr.

N82-10216 Case Western Reserve Univ., Cleveland, Ohio.
CORROSION AND PASSIVATION OF IRON AND FERROUS ALLOYS Ph.D. Thesis
Gholamabbas Nazri 1981 145 p
Avail: Univ. Microfilms Order No. 8118801

Both cyclic voltammetry and potential pulse techniques show that during passive film formation, the ferrous ions enter into the metal solution interface, which causes a formation of a deposited over-layer on the surface of the passive film. In-situ Raman spectroscopy was used to elucidate the structure of the passive film on iron. The Raman spectra of this film showed several peaks at low frequency (200-800 cm/1) which is not the same as any known stoichiometric iron oxides or oxy-hydroxides. In addition, Raman spectroscopy for air oxidized iron-chromium alloys were also used. Transmission electron microscopy of the passive film on iron showed that the passive film on iron has crystalline structure and also there are some epitaxial relationships between oxide and iron substrate. In addition, the thickness of passive films on each crystallographic plane is not the same. In this regard, a structural model for passive film on poly-crystalline iron is developed. The composition of passive film in this condition is believed to gamma-Fe2O3 with a compact mosaic type structure. Dissert. Abstr.

N82-10989# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SOLIDIFICATION CHARACTERISTICS OF SUPERALLOYS UNDER NONEQUILIBRIUM CONDITION
Fu Hengzhi *In its* Recent Selected Papers of NW Polytech. Univ., pt. 1 (FTD-ID(RS)T-0259-81-Pt-1) 20 Aug. 1981 p 191-219 refs Transl. into ENGLISH from Recent Selected Papers of NW Polytech. Univ., pt. 1 (Xiam Shaanxi), 1979 (For primary document see N82-10980 01-99)
Avail: NTIS HC A17/MF A01

N82-10990# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE PLASTIC DEFORMATION, MICRO-CRACK INITIATION AND FATIGUE CRACK INITIATION LIFE OF 30CrMnSiNi2A HIGH STRENGTH MARTENSITE STEEL
Zheng Xiulin and Qiao Shengru *In its* Recent Selected Papers of NW Polytech. Univ., pt. 1 (FTD-ID(RS)T-0259-81-Pt-1) 20 Aug. 1981 p 220-238 refs Transl. into ENGLISH from Recent Selected Papers of NW Polytech. Univ., pt. 1 (Xian Shaanxi), 1979 (For primary document see N82-10980 01-99)
Avail: NTIS HC A17/MF A01

N82-11000# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE ISLAND STRUCTURE OF (M-A) IN HARDENED LOW-ALLOY HIGH-STRENGTH STEELS
Kang Mokuang, Guan Dunhui, Guo Chengdao, and Zhu Jinrong *In its* Recent Selected Papers of NW Polytech. Univ., pt. 2 (FTD-ID(RS)T-0260-81-Pt-2) 28 Aug. 1981 p 137-173 refs Transl. into ENGLISH from Recent Selected Papers of NW Polytech. Univ., pt. 2 (Xian Shaanxi), 1979 (For primary document see N82-10996 01-99)
Avail: NTIS HC A18/MF A01

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N82-10217 Texas Univ. at Arlington.
THERMODYNAMIC CHARACTERIZATION OF MISCIBLE POLYMER BLENDS Ph.D. Thesis
Robert Sheppard Barnum 1981 270 p
Avail: Univ. Microfilms Order No. 8119255

The thermodynamics of a miscible polymer blend of poly (cyclohexanedimethanol terephthalate-co-isophthalate), Kodar, and polycarbonate were examined experimentally. Blend specific volumes were measured as functions of temperature and composition to determine volume changes on mixing and to provide data for analysis by a modified lattice model equation of state. These data showed that volume contractions on mixing on the order of 1.4 percent in the glassy state and 0.3 percent in the melt state occurred. These negative excess volumes are

indicative of strong exothermic physical interactions between the blend components. Dissert. Abstr.

N82-10218 Virginia Polytechnic Inst. and State Univ., Blacksburg.
SYNTHESIS AND CHARACTERIZATION OF POLYCARBONATE-POLYDIMETHYSILOXANE BLOCK COPOLYMERS Ph.D. Thesis
Judy S. Riffle 1981 230 p
Avail: Univ. Microfilms Order No. 8118710

Two methods for the preparation of bispherol-A polycarbonate-polydimethyisiloxane multiblock or segmented copolymers were investigated. The first is a solution reaction which utlized the interaction of a performed alpha, omega, hydroxyl terminated polycarbonate. This synthesis produce perfectly alternating block copolymers wherein the block molecular weights are equal to the number average molecular weights of the respective well characterized oligomeric precursors. The second synthesis method investigated was a phase transfer catalyzed reaction which produced a more randomly coupled block copolymer. Preformed hydroxypropyl, hydroxybutyl, or carboxypropyl terminated siloxane oligomers were used whereas the polycarbonate blocks were produced in situ. Dissert. Abstr.

N82-10219 Missouri Univ. -Kansas City.
ACID CATALYZED HOMOPOLYMERIZATION OF CYCLIC GLYCYLGLYCINE AND COPOLYMERIZATION WITH CYCLIC LEUCYLLEUCINE TO LINEAR PEPTIDES Ph.D. Thesis
Franco Tak-On Lee 1981 215 p
Avail: Univ. Microfilms Order No. 8117657

The polymerizability of some cyclic dipeptides with sodium metal, HCl and H3PO4 catalysts is examined. The polymerization reactions of cyclic glycylglycine(I), c-dl-leucylleucine(II), c-dl-phenylalanylphenylalanine(III), and cyclic glycyl-l-leucine; and the copolymerizations of (I) with (II), and of (I) with (III), were investigated. The homo- and copolypeptides from acid catalyses are all white to yellow, and insoluble in conventional solvents. From infrared and X-ray data, the polyglycine obtained may possess polyglycine I or polyglycine II type confirmation, or both, depending on the catalytic system employed. Infrared spectroscopy of the polyleucylglycine shows features indicating a predominance of polyglycine II type conformaton. The leucylglycine copolymer obtained with HCl catalyst under varying conditions of temperature, time, and comonomer ratio, display identical infrared spectra. This suggests a rather constant polymer structure, probably related to the consistently low leu/gly incorporation ratio in the copolymer. Dual polymerization mechanisms are suggested for the acid catalyzed reactions. A competition probably exist between (1) a ring-opening mechanism, and (2) polycondensation after ring clevage by hydrolysis. Dissert. Abstr.

N82-10220 Polytechnic Inst. of New York, Brooklyn.
THERMAL DEGRADATION OF AROMATIC POLYAMIDES Ph.D. Thesis
Yash Pal Khanna 1981 135 p
Avail: Univ. Microfilms Order No. 8118880

Wholly aromatic polyamides like poly(1,3-phenylene isophthalamide) and poly(1,4-phenylene terephthalamide), also known as Nomex and Kevlar respectively, are commercially used in the fabrication of wide-bodied aircraft interiors. Therefore, improving the flammability behavior of these materials is of obvious importance. As a result of earlier studies which related the effect of substituents to char formation and flammability, the effect of a chlorine substituent on the degradation characteristics of the two polyamides was investigated. Dissert. Abstr.

N82-10221 Case Western Reserve Univ., Cleveland, Ohio.
STRUCTURE AND POLYMERIZATION STUDY OF NORBORNENE ENDCAPPED POLYIMIDES WITH FT-NMR SPECTROSCOPY Ph.D. Thesis
Andrew Chung-Lap Wong 1981 164 p
Avail: Univ. Microfilms Order No. 8118640

Due to the intractable, insoluble nature of the cured polymer, model compounds N-phenyl-5-Norbornene-2,3-dicarboximide (PN) and 2NE/MDA were synthesized and their polymerization mechanisms studied. Solution state carbon-13 and high field proton (270 MHz) NMR were used to investigate PN cured at various temperatures and column chromatography was used to separate the various reaction products of a partially cured sample. In cases of 2NE/MDA and PMR-10, characterization of the prepolymer and mildly cured imide samples were studied using solution state C-13 and H-1 NMR. The highly cured imide samples were insoluble in NMR solvents and were investigated utilizing C-13 solid state NMR. Research results show that during the polymerization process, the monomers (or prepolymers) undergo an endoxoisomerization in addition to the retro-Diels-Alder reaction at the norbornene endcap group. Dissert. Abstr.

N82-10222 Case Western Reserve Univ., Cleveland, Ohio.
SUSTAINED RELEASE OF BIOACTIVE AGENTS COVALENTLY BOUND TO POLYMERS Ph.D. Thesis
Mark Allen VanDress 1981 147 p
Avail: Univ. Microfilms Order No. 8118638

The synthesis of a polymeric pro-drug by covalently binding the drug to the polymer via a hydrolytically cleavable bond is described. As these bonds cleave, upon exposure to a hydrolyzing medium, the bioactive agent is slowly released. The hydrophilic/hydrophobic nature of the polymer in determining the release behavior of the bioactive agent is considered. In attempting to appreciate this aspect of release behavior, a herbicide system was synthesized and studied as a basis for comparison with a contraceptive system. Poly-L-glutamic acid was used as a biodegradable polymer to which 3-oximinonorethindrone was covalently linked via the hydrolytically labile oxime ester bond. The release behavior of both the contraceptive system and the herbicide system is described by pseudo-first order kinetics and the rate constants are seen to increase with increasing hydrophilic character of the polymer. Hydrolysis of the labile bond is seen to be the rate determining step for release. Dissert. Abstr.

N82-10223 Case Western Reserve Univ., Cleveland, Ohio.
CALCULATION OF THE ORGANIZATION OF CHAIN MOLECULES IN THE SOLID STATE Ph.D. Thesis
Sukant Kishore Tripathy 1981 131 p
Avail: Univ. Microfilms Order No. 8118637

Several types of molecular structure calculations relating to the organization and assembly of macromolecules were developed. A general method is presented to calculate and minimize the packing energy of a polymer crystal. Expressions are derived to compute the interaction energy of each unique row of atoms, treated as periodic force centers, with an atom not belonging to the lattice generated by the set of row atoms. The total energy is assumed to be the pair-wise additive sum of atomic interactions expressed in terms of the inverse powers of interaction distances using classical Lennard-Jones type dispersive/repulsive and coulomb types electrostatic potential functions. Mathematical tractability is obtained by expanding the series sum with the periodicity of the row lattice vectors. Rapid convergence of these series facilitates truncation to desired accuracy. The packing energy, defined to be the interaction energy of central conformational repeat unit interacting with a selectable number of surrounding polymer chains, is minimized with respect to the unit cell parameters for an assumed symmetry. Dissert. Abstr.

N82-10224 Akron Univ., Ohio.
STRUCTURE-PROPERTY RELATIONSHIPS OF PERFECTLY ALTERNATING
NE BLOCK COPOLYMERS Ph.D. Thesis
Solomon Hsing-Kuo Tang 1981 126 p
Avail: Univ. Microfilms Order No. 8117727

The relationships between the properties and microstructures of two series of perfectly alternating bisphenol-A polycarbonate-polydimethylsiloxane block copolymers were studied. In the first series the poly-carbonate (PC) block length was kept constant while the block length of polydimethylsiloxane (PDMS) was varied. The tensile properties of these block copolymers were found to be a function of composition. Dynamic mechanical properties measured as a function of temperature revealed the two-phase nature of these materials. Transmission electron micrographs showed that all samples had a sponge-like morphology independent of composition. The rheological properties as studied on the capillary meometer showed a maximum viscosity for the sample contining PC and PDMS blocks of equal molecular weight and extrudate swells increasing with PC content. In a second series of block copolymers the block molecular weights of both PC and PDMS were varied to keep the composition constant. The tensile strength of these samples was found to increase

with block molecular weights except for the sample having the highest block molecular weights. The lower tensile strength of this material was attributed to its lamellar type morphology.
Dissert. Abstr.

N82-10225 Detroit Univ., Mich.
POLYMERIC BUILDING BLOCKS FROM RENEWABLE RESOURCES: FRUCTOSE Ph.D. Thesis
Deenadayalu Chundury 1980 153 p
Avail: Univ. Microfilms Order No. 8116030

Five-Hydroxymethyl-furfuraldehyde (HMF) was prepared from high fructose corn syrup (HFCS) or crystalline D-fructose in high yields and purity. A 95 to 97% conversion of fructose to HMF was achieved using 25 mole per cent (based on fructose) boron trifluoride etherate catalyst in dimethyl sulfoxide, under a nitrogen atmosphere, a reaction temperature of 100 C, and a half hour reaction time. A 92 to 95% conversion of HFCS or crystalline D-fructose to 5-chloromethylfurfuraldehyde (CMF) was achieved using 300 mole % of conc. hydrochloric acid in chlorobenzene, under a nitrogen atmosphere, a reaction temperature of 75 C, and two or one hour reaction time, respectively. Polymeric building blocks were prepared from 5-hydroxymethyl- and 5-chloro-methylfurguraldehyde. Dissert. Abstr.

N82-10226 Lehigh Univ., Bethlehem, Pa.
THE PREPARATION AND SURFACE CHARACTERIZATION OF POLYSTYRENE LATEXES AS MODEL COLLOIDS Ph.D. Thesis
Ahmed Abdel-Moneim Kamel 1981 230 p
Avail: Univ. Microfilms Order No. 8118838

Preparation of a model colloid with one type of surface group is described. Several conventional polystyrene latexes were prepared, cleaned by a mixed bed of anionic and cationic resins, and their surfaces characterized by conductometric titration. All latexes carried a strong-acid group; no weak-acids were detected. The electrophoretic mobility behavior of latex 520 (prime) was studied as a function of pH. All three forms of the latex displayed the same trends, showing no changes at intermediate pH ranges, while at lower pH the mobility decreased. In alkaline pH, the mobility first increased slightly before decreasing at higher pH. These trends were explained in terms of ion adsorption and acid-base interactions. At neutral pH, all three forms of the latex exhibited approximately the same zeta potential. Argon gas adsorption measurements gave surface areas that were in good agreement with those obtained from electron microscopy. The polymer surface was nonporous and mostly hydrophobic with only few polar sites. Dissert. Abstr.

N82-10227*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
METHOD OF NEUTRALIZING THE CORROSIVE SURFACE OF AMINE-CURED EPOXY RESINS Patent Application
Sheng Yen Lee, inventor (to NASA) Filed 14 Aug. 1981 9 p
(NASA-Case-GSC-12686-1; US-Patent-Appl-SN-293412) Avail: NTIS HC A02/MF A01 CSCL 11I

The corrosive alkaline surface layer of an epoxy resin product formed by the curing of the epoxy with an aliphatic amine is eliminated by first applying a non-solvent to remove most or all of the free unreacted amine and then applying a layer of a chemical reagent to neutralize the unused amine or amine functional groups by forming a substituted urea. The surface then may be rinsed with acetone and then with alcohol. The non-solvent may be an alcohol. The neutralizing chemical reagent is a monoisocyanate or a mono-isothiocyanate. Preferred is an aromatic mono-isocyanate such as phenyl isocyanate, nitrophenyl isocyanate or napthyl isocyanate. NASA

N82-10228*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
HIGH TEMPERATURE GLASS THERMAL CONTROL STRUCTURE AND COATING Patent Application
David A. Stewart, Howard E. Goldstein, and Daniel B. Leiser, inventors (to NASA) (Stanford Univ., Calif.) Filed 2 Oct. 1981 18 p
(NASA-Case-ARC-11164-1; US-Patent-Appl-SN-308007) Avail: NTIS HC A02/MF A01 CSCL 11C

A high temperature stable and solar radiation stable thermal control coating either useful as such, applied directly to a member to be protected, or applied as a coating on a reusable surface insulation is discussed. The coating has a base coat layer and an overlay glass layer. The base coat layer has a high emittance, and the overlay layer is formed ffrom discrete, but sintered glass particles to give the overlay a high scattering coefficient. The resulting two-layer space and thermal control coating has an absorptivity-to-emissivity ratio of less than or equal to 0.4 at room temperature, with an emittance of 0.8 at 1200 F. It is capable of exposure to either solar radiation or temperatures as high as 2000 F without significant degradation. A reusable surface insulation structure in corporating the coating and having primary application as a space shuttle heat shield is also discussed. NASA

N82-10229# Bendix Corp., Kansas City, Mo.
PROCESS SCALE-UP FOR THERMALLY STABLE MOLDING COMPOUNDS Final Report
D. A. Young Aug. 1981 24 p
(Contract DE-AC04-76DP-00613)
(DE81-030201; BDX-613-2675) Avail: NTIS HC A02/MF A01

Trial runs were made at an independent research laboratory to demonstrate the scale-up from a batch to a continuous process for the preparation of silicone- and polyimide-based molding compounds. Coatings were applied in two stages to both a fiberglass cloth and mat. Molding tests on the product were used to substantiate the cure conditions needed for each coating. The knowledge obtained provided the information needed for planning a proposed production facility to prepare these molding compounds. DOE

N82-10230# British Gas Corp., Newcastle-upon-Tyne (England). Engineering Research Station.
POLYETHYLENE GAS PIPE SYSTEMS: AN APPRAISAL OF JOINT DESIGN AND CONSTRUCTION METHODS
L. Ewing and W Richardson Nov. 1980 21 p refs Presented at Plastics and Rubber Inst. Yorkshire Section Conf. on Jointing and Fabric. of Thermoplastics Pipe and Struct., Bradford, England, 29 Oct. 1980 and at Am. Gas Assoc. 7th Plastic Pipe Symp., New Orleans, 12-14 Nov. 1980
(ERS-E-267) Avail: NTIS HC A02/MF A01

The properties of polyethylene pipes are compared with iron and steel, and likely modes of failure are considered. Developments in heated tool fusion jointing, fusion fittings with integral heating elements, and end-load resistant mechanical joints are reviewed. Quality control of field construction is also discussed. The provision of operator training aids and visual quality control procedures are described. The suitability of ultrasonics for the nondestructive examination of joints is evaluated. Author (ESA)

N82-10231# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Abt. Technologie und Warmfestigkeit.
THE DETERMINATION OF HIGH TEMPERATURE STRENGTH OF CERAMIC DISCUSSION OF TESTING TECHNIQUES: FLEXURAL AND TENSILE TESTS CREEP TESTS WITH FLEXURAL AND TENSILE LOADING
Werner Gebhard Jan. 1981 37 p refs Report will also be announced as translation (ESA-TT-716) In GERMAN; ENGLISH summary
(DFVLR-Mitt-81-03) Avail: NTIS HC A03/MF A01; DFVLR, Cologne DM 8,90

High temperature strength of ceramic materials was determined within the service temperature range of an automobile gas turbine. For the use of ceramics as construction materials in gas turbine assemblies, results for flexural and tensile behavior are of varying consequence. In particular for turbine blades, centrifugal force at the blade root entrains forces that can cause large mechanical strain. Test apparatus is described, and test philosophy for the characterization of creep is discussed. The stress exponent n of secondary creep rate is specified from flexural and tensile creep tests, and the n data of different ceramic materials is presented. Author (ESA)

N82-10232# National Bureau of Standards, Washington, D.C.
POLYMER SCIENCE AND STANDARDS DIVISION Annual Report
Ronald K. Eby, Martin G. Broadhurst, James M. Cassel, Bruno

M. Fanconi, Isaac Sanchez, and Leslie E. Smith Apr. 1981 91 p refs
(PB81-215287; NBSIR-81-2263) Avail: NTIS HC A05/MF A01 CSCL 11I

Many separate investigations addressing dielectric plastics, polymer standards, migration phenomena, mechanical durability, and dental and medical materials are summarized. A listing of patents, publications, and seminars is also given. GRA

N82-10233# National Bureau of Standards, Washington, D.C. National Engineering Lab.
FLAMMABILITY MEASUREMENTS ON FOURTEEN DIFFERENT HYDRAULIC FLUIDS USING A TEMPERATURE-PRESSURE SPRAY IGNITION TEST
Joseph J. Loftus, Nilsa Jaarez, Adalberto Maldonado, and Jeffrey A. Simenauer Mar. 1981 29 p Sponsored in part by the Mine Safety and Health Administration, and the Bureau of Mines
(PB81-214173; NBSIR-81-2247) Avail: NTIS HC A03/MF A01 CSCL 11H

A spray ignition flammability test procedure to qualify hydraulic fluids for use in underground coal mines is described. The test procedure allows for quantitative measurement of heat and energy developed by fluids which may ignite in the test and provides for rank ordering of fluids according to their flammability. The testing program included currently used fluids such as invert emulsions, synthetics, and water glycols. Studies showed that the water glycol fluids were the only fluid type to resist ignition by spray testing. All other fluid types were ignited and in some cases produced considerable flaming. GRA

N82-10234 Akron Univ., Ohio.
TELECHELIC POLYMERS AND SEQUENTIAL COPOLYMERS BY BCi3 COINITIATED CATIONIC POLYMERIZATIONS Ph.D. Thesis
Robert Alan Smith 1981 179 p
Avail: Univ. Microfilms Order No. 8117725

Boron trichloride, used in conjunction with appropriate cationogens, polymerizes isobutylene with complete absence of chain transfer to monomer. The only chain breaking event is chlorination of the growing polyisobutylene chain by the counterion-leading to polyisobutylene containing a tertiary chlorine in the omega-position. From this understanding of the elementary reactions of the organic chloride/boron trichloride/isobutylene polymerization system, alpha-olefin, omega-chloropolyisobutylene was synthesized and characterized by GPC and by exposidation/titration. The telechelic polyisobutylene was utilized in synthesizing alpha-olefinpoly(isobutylene-b-alpha-methylstyrene), which has been characterized by GPC, NMR and osmometry.Dissert. Abstr.

N82-10235 Akron Univ., Ohio.
SYNTHESIS AND CHARACTERIZATION OF SEQUENTIAL COPOLYMERS FROM POLYCHLOROPRENE BY CARBOCATIONIC TECHNIQUES Ph.D. Thesis
Sebastian Sebastian Plamthottam 1981 109 p
Avail: Univ. Microfilms Order No. 8117719

Grafts comprising a polychloroprene backbone carrying poly(isobutyl vinyl ether), polyisobutylene, an poly(isobutylene-b-alpha-methylstyrene) were synthesized using select cationic coinitiators. The discovery that allylic chlorines in conjunction with silver hexafluorophosphate initiate isobutyl vinyl ether polymerization was exploited to synthesize poly(chloroprene-g-isobutyl vinyl ether). Selective solvent extraction of the graft coupled with H(1)NMR, DSC, and thermal dehydrochlornation indicate the presence of poly(isobutyl vinyl ether) branches. Thermal dehydrochlorination indicates the absence of active chlorine in the graft copolymer. Application of principles similar to those used for the synthesis of poly(chloroprene-g-isobutyl vinyl ether) was employed for the synthesis of grafts comprising a polychloroprene backbone carrying polyisobutylene branches with tertiary chlorine endgroups using the polychloroprene/BCl3/isobutylene system. This graft in conjunction with diethylaluminum-chloride was used to initiate alpha-methylstyrene polymerization and led to the synthesis of a new graft-block: poly [chloroprene-g-(isobutylene-b-alpha-methylstyrene)].
Dissert. Abstr.

N82-10236 Akron Univ., Ohio.
CHAIN MICROSTRUCTURE STUDIES OF POLY (VINYLFLUORIDE) BY HIGH RESOLUTION NMR SPECTROSCOPY Ph.D. Thesis
Fu-Mei Chen Lin 1981 253 p
Avail: Univ. Microfilms Order No. 8117717

The same sample of poly(vinylfluoride) (PVF) was carefully examined by 3 different types of high resolution NMR spectroscopy: F-19 at 282MHz, H-1 at 300MHz and C-13 at 20MHz. Chemical shifts, spectral line-intensities, spin-spin coupling constants, spin-lattice relaxation times and nuclear Overhauser effect values were measured, and wre used to assign the various MNR spectral peaks to particular polymer chain microstructures. The results of these studies by F-19 V-13 and H-1 NMR are in close agreement with each other, and reconfirm that the PVF molecular chains contain both backwards monomer addition and stereotactic irregularity. However, F-19 NMR spectra continue to provide the most detailed and quantitative information about the microstructure of PVF polymer chains. Dissert. Abstr.

N82-10237 Akron Univ., Ohio.
PROPERTIES OF CRYSTALLINE-RUBBERY POLYMER BLENDS AND BLOCKS WITH DIFFERING COMPATIBILITY AND CHAIN STIFFNESS Ph.D. Thesis
Ching-Chi Edward Kuo 1981 202 p
Avail: Univ. Microfilms Order No. 8117716

Blends of cis-polyisoprene and trans-polyisoprene are examined experimentally in terms of the melting point dependence, the crystallization behavior, and the changes in spherulite size. The segment interaction parameter is found to be zero. An increase in crystallinity with increasing content of cis-polyisoprene is found and is ascribed to an increase in the visocisty of the medium. The spherulite size decreases monotonically. Block copolymers of poly(butadiene-b-n-hexylisocyanate), PB-PHIC, are considered because of the large difference in chain polarity and chain stiffness between isocyanate and hydrocarbon groups. Both homopolymers of poly(n-hexylisocyanate) and block copolymers of polybut-co-n-hexylisocyanate were synthesized. A deviation from the GPC universal calibration curve is found for the block copolymer of polybutadiene-co-n-hexylisocyanate, while the high molecular weight homopolymer of poly(n-hexylisocyanate) can be fitted into the universal calibration. The crystal structure and crystal morphology of PHIC were also studied. Dissert. Abstr.

N82-10238 Akron Univ., Ohio.
CHARACTERIZATION OF THE FATTY ACIDS FROM GUAYULE RESIN AND THEIR DEGRADATIVE EFFECTS ON NATURAL RUBBER Ph.D. Thesis
Robert Walter Keller 1981 207 p
Avail: Univ. Microfilms Order No. 8117715

The fatty acids present in Guayule Resin were isolated and preliminary results indicated that these fatty acids are primarily responsible for the acceleration of natural rubber oxidative degradation. Analysis of the fatty acids revealed a relatively high unsaturated fatty acid content. It is concluded that the unsaturated fatty acids oxidized readily to form peroxy compounds which then function as initiators in the Boiland oxidation scheme as applied to natural rubber. Kinetic measurements were performed using molecular weight measurements and by studying the oxidation exotherms by differential scanning calorimetry of purified natural rubber containing various levels of the methyl esters of Guayule fatty acids. These kinetic studies indicated that the unsaturated fatty acids are acting as initiators of rubber oxidation verifying the concept that these fatty acids are primarily responsible for the ability of Guayule Resin to accelerate the oxidation degradation of natural rubber. Dissert. Abstr.

N82-10239 Akron Univ., Ohio.
DYNAMIC PROPERTIES OF SBS BLOCK COPOLYMERS IN THE DEFORMED STATE Ph.D. Thesis
Ruey-Ming Yang 1981 140 p
Avail: Univ. Microfilms Order No. 8117736

The infuence of morphology of a series of block copolymers upon their properties were investigated. The materials studied were linear styrene-butadiene block copolymers the center block molecular weight of which were similar; the molecular weights of their polystyrene end block varied over a wide range. The dynamic properties of these materials were studied as a function

of a previously applied static strain. They were found to differ strongly from those observed on conventional well vulcanized elastomers. While the energy loss per cycle is not affected by moderate static deformations in the latter group of materials, that found for the block copolymers exhibited a strong peak at static strains around 0.1. At the same strains a strong stress softening effect can be observed in the static stress-strain curve. Dissert. Abstr.

N82-10240 Akron Univ., Ohio.
VOLUME DILATION OF FILLED SBR VULCANIZATES UNDER UNIAXIAL STRAIN Ph.D. Thesis
Nirmal Kumar Agarwal 1981 169 p
Avail: Univ. Microfilms Order No. 8117704

The effect of elastomer crosslink density on volume change due to applied unaxial stress on SBR vulcanizates filled with model polystyrene fillers was investigated. The spherical polymeric fillers were prepared by emulsion polymerization techniques in a range of average particle sizes from 80 nm to 550 nm. The size distributions were relatively narrow as indicated by the ratio of surface average to number average diameters close to unity. The dispersion of filler, 25 phr, was achieved by a latex blending technique. The densities were determined by hydrostatic weighing technique. The hysteresis of the vulcanizate was found to be inversely proportional to the strain dilation. The dependence of the hysteresis on reciprocal of strain dilation increased with increasing crosslink density. Scanning electron micrograph studies of fracture surfaces of the stretched vulcanizates containing large particle size polystyrene fillers (550 nm and 2000 nm) provided direct evidence of vacuole formation at the filler rubber interface in the direction of applied tension. Dissert. Abstr.

N82-10241 Akron Univ., Ohio.
BULK AND SOLUTION PROPERTIES OF STAR-BRANCHED POLYMERS Ph.D. Thesis
Barry Jay Bauer 1981 233 p
Avail: Univ. Microfilms Order No. 8117706

The difference in free energy of phase separation between linear diblocks and stars made from f of the diblocks is calculated from entropy changes that result when the arms are linked in the mixed and phase separated systems. The variation in chain end density in the phase separated system is accounted for. Stars are found to phase separate more readily than the diblock arms that they are made from. Monte Carlo calculations using the self-interacting chains of Mazur et al are used to find the volume of random flight chains based on a minimum surface area polyhedron that encloses all of the units. This volume is close to the hydrodynamic volume of a linear molecule. Corrections are made for the irregular shape of the chains. Dissert. Abstr.

N82-10242 California Univ., Irvine.
CONFIGURATIONAL STATISTICS OF POLYSACCHARIDES; MOLECULAR WEIGHT DISTRIBUTION OF PULLULAN Ph.D. Thesis
Bruce Anthony Burton 1981 307 p
Avail: Univ. Microfilms Order No. 8118463

Theoretical chain models for the D-glucans amylose, linear dextran, and pullulan were constructed on the basis of realistic molecular geometries for the skeletal segments and estimates of the conformational energy as a function of the backbone torsion angles. Reported chain dimensions take the form of characteristic ratios of the mean square unperturbed end-to-end distance and the persistence length. A measure of chain stiffness and extension is introduced which is a type of correlation function. Representative conformations of amylose, dextran, and pullulan chains are presented as projection drawings. Comparison of these drawings and the chain dimensions calculated for each chain discloses that the alpha-1,6-linkage is a source of substantial conformational freedom in D-glucan chains which incorporate this linkage. Refinement of the theoretical model for the alpha-1,6-linkage requires that experimental studies of the coil dimensions of pullulan and other polysaccharides containing this linkage be completed. Dissert. Abstr.

N82-10243 Akron Univ., Ohio.
SYNTHESES AND CHARACTERIZATION OF Si-H AND Si-Cl END-GROUP CONTAINING POLYMERS BY CARBOCATIONIC POLYMERIZATION AND DERIVATION Ph.D. Thesis
Victor Shiow Cherng Chang 1981 218 p
Avail: Univ. Microfilms Order No. 8117707

The synthetic possibilities offered by carbocationic polymerization techniques and the chemistries of the SiCl and Si-H bonds were combined. Two fundamentally different approaches were developed. (1) A series of novel silicon-functional carbocationic initiators were synthesized and used to induce cationic olefin polymerizations. In this manner, unique polymers carrying Si-Cl or Si-H head-groups were prepared. Extensive model experiments provided guidance for subsequent carbocationic polymerizations. Experimental conditions were worked out under which none of the electrophilic species that arise during polymerization would destroy the Si-H function. (2) Polyisobutylenes were carrying one (alpha) and two (alpha, omega) terinal 1-olefin function(s) were prepared by regioselective dehydrochlorination of alpha and alpha, omega di(tert.-chloro) polyisobutylenes. Subsequent hydrosilylation with HSi(CH3)2Cl yielded the Si-Cl function, which was in turn converted by LiAlH4 reduction to the Si-H terminus. Dissert Abstr.

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers, storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N82-10244 Princeton Univ., N. J.
SOLID PROPELLANT RESPONSE FUNCTIONS DEDUCED BY FORCED LONGITUDINAL WAVES IN ROCKET MOTORS Ph.D. Thesis
Michael Matthew Micci 1981 131 p
Avail: Univ. Microfilms Order No. 8118341

Research with the Forced Longitudinal Wave (FLW) motor has demonstrated that pressure and velocity measurements inside a solid propellant rocket chamber can be utilized to deduce simultaneously the propellant pressure-coupled and velocity-coupled responses. The FLW motor represents the first attempt to measure propellant response functions within a rocket motor environment. A linear analysis of steady-state oscillations within rocket chambers has shown that oscillatory pressure measurements at the head and nozzle ends of a rocket chamber and a midchamber oscillatory velocity measurement provide sufficient information for the deduction of both real and imaginary parts of the propellant burning rate response functions. The midchamber velocity measurement was made by means of a magnetic flowmeter, a technique previously untried within solid propellant rocket chambers. Dissert. Abstr.

N82-10245*# Aerojet Liquid Rocket Co., Sacramento, Calif.
FUEL/OXIDIZER-RICH HIGH-PRESSURE PREBURNERS Final Report
L. Schoenman Oct. 1981 254 p refs
(Contract NAS3-21753)
(NASA-CR-165404) Avail: NTIS HC A12/MF A01 CSCL 21I

The analyses, designs, fabrication, and cold-flow acceptance testing of LOX/RP-1 preburner components required for a high-pressure staged-combustion rocket engine are discussed. Separate designs of injectors, combustion chambers, turbine simulators, and hot-gas mixing devices are provided for fuel-rich and oxidizer-rich operation. The fuel-rich design addresses the problem of non-equilibrium LOX/RP-1 combustion. The development and use of a pseudo-kinetic combustion model for predicting operaing efficiency, physical properties of the combustion products, and the potential for generating solid carbon is presented. The oxygen-rich design addresses the design criteria for the prevention of metal ignition. This is accomplished by the selection of materials and the generation of well-mixed gases. The combining of unique propellant injector element designs with secondary mixing devices is predicted to be the best approach. M.G.

N82-10246# Army Missile Command, Redstone Arsenal, Ala.
IMPROVED SPECIFICATIONS FOR COMPOSITE PRO-

PELLANT BINDERS FOR ARMY WEAPON SYSTEMS Final Report
James G. Carver Jun. 1981 43 p refs
(AD-A103086; DRSMI/RK-81-5-TR) Avail: NTIS HC A03/MF A01 CSCL 21/9

A process has been developed that simultaneously can determine the molecular weight, molecular weight distribution, functionality, and functionality distribution of hydroxy-terminated polymers. The samples are analyzed on a high performance GPC permeation column and the detector responses sent directly to a computer. The molecular weight and molecular weight distribution are calculated using the universal calibration procedure. By reacting the polymer with a UV chromotograph, 3,5 dinitrobenzoyl chloride, the hydroxyl groups can be detected. By ratioing the UV response and the refractive index response, the hydroxyl groups per molecule can be determined. Detailed procedures for calibration derivitization and analysis are provided. A computer program for data reduction written in BASIC for a Hewlett-Packard Lab Automation System is also provided. This project has been accomplished as part of the US Army Materials Testing Technology Program, which has for its objective the timely establishment of testing techniques, procedures, or prototype equipment (in mechanical, chemical or nondestructive testing) to insure efficient inspection methods for materiel/material procured or maintained by DARCOM. Author (GRA)

N82-10247# Southwest Research Inst., San Antonio, Tex.
MULTICYLINDER DIESEL ENGINE TESTS WITH UNSTABILIZED WATER-IN-FUEL EMULSIONS Final Report, Sep. 1978 - Jul. 1980
C. W. Coon, Jr. Jun. 1981 155 p refs
(Grant DOT-TSC-1587)
(AD-A104090; TSC-USCG-80-7; USCG-D-27-70) Avail: NTIS HC A08/MF A01 CSCL 13/10

Two diesel engines representative of the four-stroke cycle and two-stroke cycle main propulsion units installed in U.S. Coast Guard WPB class cutters were operated in a test environment in an attempt to demonstrate significant fuel savings associated with water-in-fuel emulsions. The engines were connected to a dynamometer in a laboratory test cell. A prototype fuel system was assembled that would supply unstabilized emulsions for which the water concentration could range form zero to 25 percent of the total volume of liquid supplied to the engine as fuel. An analysis of boat operation was performed in order to identify the most frequently used engine settings, and both engines were operated at test points representative of boat prop load performance. The test results for the four-stroke cycle engine indicated that an average diesel fuel saving of about 2.5 percent could be obtained at the most frequently encountered operating conditions using water concentrations of 15-25 percent. Statistical analysis procedures suggest a 90 percent confidence in the measured results. Significant reductions in exhaust smoke were also observed, although the exhaust stream opacity was low throughout the tests. For the two-stroke cycle engine, no statistically significant reduction in fuel consumption could be identified. GRA

N82-10248# Sandia Labs., Albuquerque, N. Mex.
SHOCK INDUCED HOT-SPOT FORMATION AND SUBSEQUENT DECOMPOSITION IN GRANULAR, POROUS HEXANITROSTILBENE EXPLOSIVE
D. B. Hayes 1981 89 p refs
(Contract DE-AC04-76DP-00789)
(DE81-029130; SAND-81-0506C) Avail: NTIS HC A05/MF A01

Experimental and theoretical studies on granular, porous hexanitrostilbene (HNS) explosives have yielded and increased understanding of microstructural processes occurring during initiation by shock loading. Experiments involved the planar impact of HNS specimens onto fused-silica targets. Chemical decomposition librerated gaseous products, causing the pressure in the HNS to rise. Velocity interferometry measured material velocity, hence, pressure at the fused silica/HNS interface. An analysis of this pressure excursion yields chemical decomposition history. The data are interpreted in terms of a quantitative two-temperature model which considers hot spots to be formed at pore sites as a result of the irreversible work accompanying the shock. Subsequently, decompostion completion is achieved by return fronts which propagate radially out from each hot spot at a velocity which can be determined from the bulk decomposition rate. Analysis of the experimental data in the context of the model yields several important resutls: the delay times corresponding to hot-spot decomposition are shorter than expected; model calculations show about the same inferred hot-spot temperature for different initial porosities and particle sizes in HNS, shock-loaded to equal pressures, which is consistent with experimental results. DOE

N82-10249# North Dakota Univ., Grand Forks.
CHEMISTRY OF LIGNITE LIQUEFACTION Quarterly Report, Apr. - Jun. 1981
R. J. Baltisberger, Virgil I. Stenberg, Kenneth J. Klabunde, and Neil F. Woolsey Jul. 1981 55 p refs
(Contract DE-AB18-78FC-02101)
(DE81-030178; DOE/FC-02101/18) Avail: NTIS HC A04/MF A01

Progress reports are presented for structural studies of lignite derived asphaltene and preasphaltenes and ether cleavage studies. Reports of denitrogenation caused by CO and water reactions and of electron transfer catalysis studies are also presented. Results indicate that the major differences between asphaltenes and preasphaltenes is that the molecular weight maximizes near 1500 g/mol for the preasphaltenes compared to 400 g/mol for the asphaltenes. It is further indicated that asphaltenes have little or no aliphatic or aryl aliphatic ethers whereas preasphaltenes have significant amounts. Other significant results are reported. DOE

N82-10250# Department of Energy, Bartlesville, Okla. Energy Technology Center.
LIQUID FOSSIL FUEL TECHNOLOGY Quarterly Technical Progress Report, Oct. - Dec. 1980
May 1981 77 p refs
(DE81-029912; DOE/BETC/QPR-80/4) Avail: NTIS HC A05/MF A01

Highlights of research activities at BETC during the past quarter are summarized. Major research areas include: liquid fossil fuel cycle, extraction (resource assessment and enhaned producton); processing (characterization, thermodynamics, and process technology); utilization; and product integration and technology transfer. DOE

N82-10251# Rockwell International Corp., Canoga Párk, Calif. Energy Systems Group.
MOLTEN-SALT COAL-GASIFICATION PROCESS DEVELOPMENT UNIT, PHASE 2 Quarterly Technical Progress Report, Jan. - Mar. 1981
M. H. Slater 20 Apr. 1981 57 p refs
(Contract DE-AC21-77ET-10296)
(DE81-023585; DOE/ET-10296/T2; ESG-DOE-13363; QTPR-3) Avail: NTIS HC A04/MF A01

Run 7, the second run of the Phase 2 program, was completed. The gasification system was operated for a total of 169 h at pressures up to 90 psig. Average product gas HHV values of 81 Btu/scf were recorded during 90-psig operation, while gasifying coal at a rate of 735 lb/h. The run was terminated, as planned, after 7 full days of operation. Prior to Run 7, an 80% cobalt-20% chromium alloy metal melt withdrawal orifice was installed as a replacement for a high-purity alumina orifice which had cracked during Run 6; and thus, it is suspected, contributed to the overflow system plug which prematurely terminated the test. The new metal orifice survived the entire Run 7 campaign virtually intact. DOE

N82-10252# Northwestern Univ., Evanston, Ill.
MECHANISTIC STUDY OF CATALYTIC METHANOL SYNTHESIS Progress Report
Harold H. Kung 10 Aug. 1981 6 p
(Contract DE-FG22-80OC-30239)
(DE81-028915; DOE/PC-30239/T2) Avail: NTIS HC A02/MF A01

Progress is reported on the elementary kinetics and mechanisms involved in the production of methanol by means of the hydrogenation of carbon monoxide. The relative rates of reaction were determined by means of the relaxation technique. Advance-

ment in the understanding of mixed oxide catalysts was also made during the quarter. DOE

N82-10253# Westinghouse Electric Corp., Concordville, Pa.
BASELINE DATA ON UTILIZATION OF LOW-GRADE FUELS IN GAS TURBINE APPLICATIONS. VOLUME 2: HOT COMPONENT CORROSION EVALUATION Final Report
J. J. Vitello and S. T. Scheirer Jun. 1981 64 p Sponsored in part by Electric Power Research Inst.
(EPRI Proj. 1079-2)
(DE81-903760; EPRI-AP-1882-Vol-2) Avail: NTIS HC A04/MF A01

The corrosion of turbine parts when operated with residual oil versus distillate oil was compared. A metallographic evaluation of combustion turbine hot components, which showed partial residual versus total distillate fuel firing, revealed no discernable differences in component degradation (hot corrosion). Considering the time of operation, the degree of hot corrosion observed was somewhat greater than expected for oil-fired combustion turbines of similar designs and alloy selections. This abnormality was attributed to the ingestion of high levels of sodium contaminated mist from the adjacent cooling tower hrough the turbine compressor inlet. Corrosion due to vanadium compounds in the heavy fuel machines was practically nil, which indicates that residual fuel is satisfactory for use in combustion turbine plants. DOE

N82-10254# KVB, Inc., Irvine, Calif.
BASELINE DATA ON UTILIZATION OF LOW-GRADE FUELS IN GAS TURBINE APPLICATIONS. VOLUME 3: EMISSIONS EVALUATION Final Report
T. Sonnichsen Jun. 1981 108 p refs Sponsored in part by Electric Power Research Inst.
(EPRI Proj. 1079-3)
(DE81-903764; EPRI-AP-1882-Vol-3) Avail: NTIS HC A06/MF A01

A series of field tests was conducted on two residual-oil-fired gas turbine/heat recovery steam generators (HRSG) comprising a Westinghouse PACE 260-MW combined-cycle unit. Base load emission levels were determined. A series of tests was also made at reduced operating loads. Emission measurements included: (1) gaseous constituents measured by continuous monitoring instrumentation (O2, CO2, NO, NO sub x, and SO2) and by wet chemistry methods (SO3, aldehydes, and chlorides); and (2) particulate characteristics (mass loding, smoke spot number; submicron particle size, and particle morphology). Corrected NO sub x emissions at base load were 170 ppM and 200 ppM with and without HRSG afterburners in service, respectively. The NO sub x emissions decreased with water injection by 50% and were unchanged with the turbine wash. The NO sub x increased with load. DOE

N82-10255# Gulf Research and Development Co., Pittsburgh, Pa.
UNDERGROUND GASIFICATION OF STEEPLY DIPPING BEDS. PHASE 2 REPORT: RESULTS OF RAWLINS TEST NO. 1 Final Report, 1 Mar. 1978 - 1 Mar. 1980
Jul. 1981 271 p refs Prepared in cooperation with TRW Energy Systems Planning Div., McLean, Va.
(Contract DE-AC03-77ET-13108)
(DE81-028581; DOE/ET-13108/T14) Avail: NTIS HC A12/MF A01

A 23 ft thick coal bed dipping at 63 deg was used to test the feasibility of using underground coal gasification techniques to extract energy from steeply dipping coal beds (UCG-SDB). The coal was ignited at a vertical depth of 400 ft utilizing a directionally drilled process well pair. The heating value of the product gas during the 21 day air injection phase initially climbed to approximately 180 Btu/SCF and gradually declined to the 120 to 130 Btu/SCF range. Air injection rates of 1600 to 2000 SCFM were used, and wet product gas rates between 3000 and 4500 SCFM were obtained. A 5 day steam/oxygen injection test was also conducted which increased the product gas heating value to the 220 to 260 Btu/SCF range. The environmental studies concentrated on ground water quality, air quality, surface subsidence, and personnel industrial hygiene. DOE

N82-10256# California Univ., Berkeley. Lawrence Berkeley Lab.
DETONATION-PRODUCT BEHAVIOR AT LARGE EXPANSION: THE UNDERWATER DETONATION OF NITROMETHANE
F. H. Helm, Jr., E. S. Chambers, E. Lee, M. Finger, R. R. McGuire, J. P. Mahler, H. Cheung, and J. L. Cramer Dec. 1980 29 p refs
(Contract W-7405-eng-48)
(DE81-030468; UCRL-52903) Avail: NTIS HC A03/MF A01

An underwater test which was used to measure the shock-wave travel and gas bubble resulting from the detonation of 2 kg of nitromethane is described. The bubble expansion was photographically measured to a volume of about 80 times the initial volume of the shell. These experimental measurements compared well with those calculated by a one-dimensional hydrodynamic program, KOELAS. The program also provided data to assist in the calculation of the apparent position of the shell containing the explosive, using refractive index gradients and the bubble position as a function of time. A method for estimating optical ray paths penetrating the expanding shock front and a modification to a streaking camera that permits stable operation at low rotor speeds are described. The expansion exhibited a minimum pressure of 2 MPa (20 bars), an amount in the range of rock blasting applications, underwater explosions, and rock fracturing or cratering. DOE

N82-10257# Bell Aerospace Co., Buffalo, N. Y.
HIGH-MASS-FLUX COAL GASIFIER Final Report
A. J. Simpkin May 1981 102 p refs
(Contract DE-AC01-79ET-14674)
(DE81-029807; DOE/ET-14674/16) Avail: NTIS HC A06/MF A01

This report describes the design, analysis, construction, and test activities associated with bringing a short residence time, entrained flow gasifier process development unit (PDU) to operational status are described. The basic high mass flux (HMF) gasifier, incorporated in the PDU, operates at a coal through-put of twelve tons per day, a pressure of fifteen atmospheres and processes coal, oxygen and steam to produce a synthesis. When applied to the production of substitute natural gas, the option exists to add secondary coal to the basic HMF gasifier, for the purpose of enhancing the methane content of the product. A secondary coal feed system was developed and its injection capability demonstrated in a cold flow test facility. Operability and performance of the synthesis gas stage of the HMF gasifier were demonstrated with Pittsburgh seam coal and North Dakota Lignite. Curtailment of testing precluded the conduct of any gasification tests with secondary coal injection. Included in the main program was a task to evaluate the effects of slag fluxing additives upon viscosity/temperature relationships for Pittsburgh seal coal slags. DOE

N82-10258# California Univ., Livermore. Lawrence Livermore Lab.
MODEL TESTING OF A 10-kg HIGH EXPLOSIVE BLAST ATTENUATION MAZE
C. M. Bacigalupi and W. A. Burton 1 Jul. 1981 37 p
(Contract W-7405-eng-48)
(DE81-029297; UCRL-53160) Avail: NTIS HC A03/MF A01

The basement area of the proposed High Explosive Applications Facility (HEAF) at the Lawrence Livermore National Laboratory includes 10-kg HE assembly and process cells, and a 10-kg corridor for the transport of up to 10 kg of HE from the receiving dock to the cells and to the experimental firing tanks. A process cell-maze configuration that attenuated the effects of an accidental 10-kg detonation to acceptable levels (maximum of 10 to 11 psi reflected) was developed. Scale model tests were conducted to confirm the maze design and to determine the blast pressures in adjacent areas in the final HEAF building configuration. In addition, pressure/time information was obtained at selected points in the model expansion chamber to provide the architect-engineer with information for structural design. DOE

N82-10259# General Electric Co., St. Petersburg, Fla. Corporate Research and Development.
EXPERIMENTAL EVALUATION OF THE STEADY-STATE

AND DYNAMIC PERFORMANCE CHARACTERISTICS OF THE INTERACTIVE UNITS OF A COAL-GASIFICATION PROCESS Quarterly Report, 28 Dec. 1980 - 29 Mar. 1981
J. C. Corman Apr. 1981 75 p refs
(Contract DE-AC01-80ET-14928)
(DE81-028995; DOE/ET-14928/1) Avail: NTIS HC A04/MF A01

The technology base required to premit coal conversion systems to operate within the constraints imposed by end use applications was investigated. A series of unfired dynamic tests along with fired steady state tests were defined. Thermal decomposition of ammonia was investigated. High conversion rates were observed for binary NH3/H2 gas mixtures. Conversion was found to be thermodynamically limited when substantial H2 and N2 concentrations are present. The overall structure of the IGCC mathematical model has been developed and information flow reqirements associated with each component in the model were defined. The computer model for the gasifier and the first water quench were completed. DOE

N82-10260# Hydrocarbon Research, Inc., Lawrenceville, N. J.
H-COAL PROCESS IMPROVEMENT STUDY. BENCH UNIT BASELINE RUN WITH PREHEATER/REACTOR
May 1981 56 p
(Contract DE-AC05-77ET-10152)
(DE81-026022; DOE/ET-10152/T6; FE-10152-65) Avail: NTIS HC A04/MF A01

The thermal dissolution of coal and its effects on the mechanism of coal liquefaction in an H-coal system is investigated. The two-stage coal liquefaction system consists of a coal slurry preheater which is essentially a short residence time reactor and a liquefaction reactor which can be regarded as a catalytic-hydrogenation-reactor. The preheater design and unit modifications are discussed. Results of the run to obtain baseline data with the preheater integrated in the bench unit system are compared with those of previous bench runs at similar operating conditions without a preheater, and also to previous PDU operations at similar conditions. These comparisons were made to determine what effect a preheater has on product yields and product quality. It is concluded that a preheater tends to increase heavy liquid yields with more residual oil and a higher proportion of heavy distillates in the distillate product. DOE

N82-10261# Catalytic, Inc., Wilsonville, Ala.
EVALUATION OF LIQUID-PHASE DRILLING AS A TECHNIQUE FOR SRC SOLIDIFICATION
H. E. Lewis Jun. 1981 27 p ref
(Contracts DE-AC05-76ET-10154; RP1234-1-2)
(DE81-025638; DOE/ET-10154/T9; FE-2270-80) Avail: NTIS HC A03/MF A01

A process for solidifying solvent refined coal (SRC) by injecting molten material into a column of water was developed. It was tested in a series of short, pilot-scale experiments using a column 78 mm (3 in.) in diameter and a maximum of 3.05 m (10 ft) high. The technical feasibility of the process concept was established within experimental limits. An engineering evaluation of the test results was conducted and a preliminary estimate of process costs for a drilling module sized to solidify 3400 tons of SRC per day developed. It was found that while the process advantages contemplated are probably valid, there are offsetting disadvantages which must be evaluated carefully before further effort is committed to process development. DOE

N82-10262# Aluminum Co. of America, Pittsburgh, Pa.
PULVERIZED-COAL FIRING OF ALUMINUM MELTING FURNACES Quarterly Technical Progress Report, 1 Oct. - 31 Dec. 1979
C. E. West Oct. 1980 56 p refs
(Contract DE-AC01-78CS-40037)
(DOE/CS-40037/T2) Avail: NTIS HC A04/MF A01

Progress is reported on the demonstration program of an efficient, environmentally acceptable coal firing process suitable for implementation on melting furnaces in the aluminum industry. Specific tasks reported on are: design of burner A, process equipment design and layout, purchase of process equipment, and fabrication of burner A. The status report on phase I data deliverable and a cost summary are presented. DOE

N82-10263# Midwest Research Inst., Golden, Colo. Solar Energy Information Data Bank.
ALCOHOL FUELS BIBLIOGRAPHY, 1901 - MARCH 1980
Apr. 1981 468 p
(Contract DE-AC02-77CH-00178)
(DE81-025482; SERI/SP-751-902) Avail: NTIS HC A20/MF A01

This annotated bibliography is subdivided by subjects, as follows: general; feedstocks-sugar; feedstocks-starch; feedstocks-cellulose crops and residues; productions; coproducts; economics; use as vehicle fuel; government policies; and environmental effects and safety. DOE

N82-10264# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
CHEMISTRY AND MORPHOLOGY OF COAL LIQUEFACTION Quarterly Report, 1 Jan. - 30 Mar. 1981
Heinz Heinemann Mar. 1981 20 p
(Contract W-7405-eng-48)
(DE81-028899; LBL-12933) Avail: NTIS HC A02/MF A01

A novel cobalt mediated, reversible cleavage of a vinyl-hydrogen bond was discovered. All products from the thermal decomposition of tetralin were identified. The stereochemistry of cis-1, 2 dihydrotetralin was determined. In the utilization of the water gas shift reaction as a reducing agent for model coal compounds it was found that tributylphosphine ligands increase the life of transition metal hydride catalysts. Rates of demetallation of high metal content gas oils over cobalt-molybdena-alumina catalysts were measured for vanadium and iron. It is clearly shown that pore plugging of the catalyst occurs early and results in deposition of the metals on the external catalyst surface. DOE

N82-10265# California Univ., Livermore. Lawrence Livermore Lab.
COMPARISON OF MOLECULAR-DYNAMICS CALCULATIONS WITH OBSERVED INITIATION PHENOMENA
F. E. Walker, A. M. Karo, and J. R. Hardy (Nebraska Univ.) 5 Jun. 1981 48 p refs Presented at the 7th Symp. on Detonation, Annapolis, Md., 16-19 Jun. 1981
(Contract W-7405-eng-48)
(DE81-024713; UCRL-85187; CONF-810602-28) Avail: NTIS HC A03/MF A01

Molecular dynamics calculations of the effects of the interaction of shock waves with condensed systems representing chemical explosives were completed and the microscopic effects of material characteristics known to cause changes in the sensitivity of explosives - voids and cracks, crystal defects, inclusions, initial temperature, and shock strength were explored. An instructive correlation with the macroscopic results was seen. In studies of voids in model two dimensional diatomic systems, such as face centered cubic nitric oxide and sulfur nitride lattices impacted by aluminum plates, the qualitative behavior was found to be much the same, whether the system is initially quiescent or thermal. Experimental evidence shows that chemical bonds can be broken by strictly mechanical forces to form free radicals, and the calculations indicate that a similar process can occur in condensed explosives within a shock front. This process is not in thermal equilibrium nor does it obey the rules of statistical mechanics. DOE

N82-10266# Mason and Hanger-Silas Mason Co., Inc., Amarillo, Tex.
STUDY FOR COMPACTING THE EXPLOSIVE LX-17
J. D. Harrell Jun. 1981 8 p refs
(Contract DE-AC04-76DP-00487)
(DE81-769469; MHSMP-81-28) Avail: NTIS HC A02/MF A01

The effects of compacting process variables on the pressed density of LX-17 were determined. The variables evaluated were pressre, number of compaction cycles, and dwell time. Density was influenced to the greatest degree by the number of compaction cycles. A maximum of five cycles was studied. Smaller but significant increases in densities were achieved in raising the pressure from 140 MPa to 196 MPa and increasing the dwell time from 15 minutes to 240 min. Two lots of Lx-17 containing different TATB particle size specification. Significant differences in pressed densities were observed between these two LX-17 lots. DOE

N82-10267# Argonne National Lab., Ill. Energy and Environmental Systems Div.
ENHANCEMENT OF METHANE GAS PRODUCTION USING AN INDUSTRIAL WASTE IN ANAEROBIC DIGESTION
L. Fradkin and F. Kremer (ESCOR, Inc.) 1980 10 p refs Presented at the 3rd Miami Intern. Conf. on Alternative Energy Sources, Fla., 15-18 Dec. 1980
(Contract W-31-109-eng-38)
(DE81-023819; CONF-801210-26) Avail: NTIS HC A02/MF A01

Chrominum can block enzymatic systems or interfere with essential cellular metabolites of most oxidizing bacteria. In general, heavy metals coagulate and precipitate proteins, many of which are denatured by this action. The effects on anaerobic digestion of chromium shavings from leather tanning were examined. Leather chrome shavings (which contain proteins, nitrogen, and fats) were added to two of three digesters at various rates. The methane gas production of the experimental units improved significantly compared to the control. In addition, the presence of a toxic loading or change of feed had no harmful effect on the digester performance. DOE

N82-10268# Mound Lab., Miamisburg, Ohio.
PRICETOWN 1 UNDERGROUND COAL GASIFICATION FIELD TEST: OPERATIONS REPORT
A. K. Agarwal and R. E. Zielinski 1981 269 p refs
(Contract DE-AC04-76DP-00053)
(DE81-025162; MLM-MU-81-62-0007) Avail: NTIS HC A12/MF A01

An Underground Coal Gasification (UCG) field test in bituminous coal was successfully completed near Pricetown, West Virginia. The viability of the linked vertical well (LVV) technology to recover the 900 foot deep, 6 foot thick coal seam was determined. A methane rich product gas with an average heating value of approximately 250 Btu/SCF was produced at low air injection flow rates during the reverse combustion linkage phase. Heating value of the gas produced during linkage enhancement phase was 221 Btu/SCF with air injection. The high methane formation was attributed to the thermal and hydrocracking of tars and oils along with hydropyrolysis and hydrogasification of coal char. The high heating value of the gas was the combined effect of residence time, flow pattern, injection flow rate, injection pressure, and back pressure. During the gasification phase, a gas with an average heating value of 125 Btu/SCF was produced with only air injection, which resulted in an average energy production of 362 MBtu/day. DOE

N82-10269# Aerojet Energy Conservation Co., Sacramento, Calif.
STUDY OF GELLED LNG Final Technical Report
M. I. Rudnicki, J. A. Cabeal, L. C. Hoffman, R. A. Newton, R. K. Schaplowsky, and E. M. VanderWall May 1981 110 p
(Contract DE-AC03-80SF-10846)
(DE81-023259; DOE/TIC-11452) Avail: NTIS HC A06/MF A01

Progress is reported in the following areas: characterization of gelled LNG (GELNG) rheological properties, assessment of the relative leakage of GELNG vs LNG through a perforated wall, relative spread and vaporization rates of unconfined spills on water, and relative spread and vaporization rates of unconfined spills on land. Shear stress vs strain rate was determined for a range of gelant concentrations. The shear diagram was extended to cover shear rates in the range of 13 to 14,800 inverse seconds, expanding previous results at both low and high shear rates. Leakage tests of GELNG through a known geometry perforation were conducted along with comparative testing with LNG. Rapid cessation of flow through the perforated plate was observed for all tested concentrations of GELNG and at all driving pressures. Land spills were found to give inconclusive results due to difficulties in measuring transient weight changes during the spill. Gelatin increases total vaporization time significantly in water spills. DOE

N82-10270# Research Inst. of National Defence, Stockholm (Sweden). Huvudavdelning 2.
EXPLOSIVE MIXTURES OF HYDROCARBONS, ALUMINUM AND AIR [EXPLOSIVA BLANDNINGAR AV GASOL-ALUMINIUM-LUFT]
Stefan Lamnevik Nov. 1980 10 p refs In SWEDISH
(FOA-C-20389-D1) Avail: NTIS HC A02/MF A01

Optimal energy, deflagration velocities and pressures, explosion velocities and pressures occur in stoichiometric mixtures, e.g., 4.0% propane in air, 3.1% butane in air and with 338 g aluminum per cu meter. The maximum energy output for hydrocarbon fair is cu 10.4 mJ/normal cu m of fuel air mixture. Detonation data for five stoichiometric mixtures with different proportions of propane, aluminum and air were calculated by means of the state equations for ideal gases. Detonation velocities, 1.80 to 1.93 Km/sec, and detonation pressures of 1.9 to 2.7 M.Pa are obtained. Necessary priming energies for the deflagration vary from 0.3 mJ (propane-air) to multiples of 10 mJ (aluminum-air). For the priming of the detonating mixtures 1 to 100 g. of detonating material is required. Author (ESA)

N82-10271# Council for Scientific and Industrial Research, Pretoria (South Africa). Chemical Engineering Group.
SELECTIVITY IN FISCHER-TROPSCH SYNTHESIS: REVIEW AND RECOMMENDATIONS FOR FURTHER WORK
L. Caldwell Jun. 1980 42 p refs
(PB81-223596; CSIR-SR-CHNG-330) Avail: NTIS HC A03/MF A01 CSCL 21D

A broad product spectrum is obtained from the Fischer-Tropsch synthesis aimed at the production of gasoline and diesel fuels. This is a consequence of the carbon atom by carbon atom mechanism of chain growth. There is potential for narrowing the product spectrum by use of dual-function catalysts or transient process conditions. GRA

N82-10272# Battelle Pacific Northwest Labs., Richland, Wash.
KINETICS AND CATALYSIS OF PRODUCING SYNTHETIC GASES FROM BIOMASS Annual Report, 7 Dec. 1979 - 6 Dec. 1980
L. J. Sealock, Jr., D. C. Elliott, S. L. Weber, and R. J. Robertus Jan. 1981 129 p refs
(Contract GRI-5014-361-0242)
(PB81-217614; GRI-79-0100) Avail: NTIS HC A07/MF A01 CSCL 21D

The kinetics, reaction sequences, and pathways involved in pyrolysis and catalytic steam gasification of wood and wood components were investigated. An autoclave and a batch reactor were used to study gasification at low temperature and high temperature regimes. Kinetic studies of the carbon steam reaction relative to cellulose and lightning gasification were completed. Reaction rate constants and activation energies were determined for three catalyzed cases and for a noncatalyzed case. The formation of specific compounds during gasification in the presence and absence of catalyst was investigated in both reactor systems. Results of the experiments demonstrate dramatic effects on the kinetics and gas composition as a function of the various catalyst and catalyst concentrations tested. GRA

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N82-10273 Colorado State Univ., Fort Collins.
THE DYNAMICS OF WIND-INDUCED OSCILLATIONS OF BLUFF BODIES Ph.D. Thesis
Abraham Babatunde Adenigba 1981 80 p
Avail: Univ. Microfilms Order No. 8119685

The investigation of the dynamic capabilities of the Iwan-Blevins model prediction wake-vortex induced oscillation of bluff bodies using Hopf bifurcation theory is described. Bifurcation, stability, direction of bifurcation, periodic orbits and response diagrams were obtained and classified. Comparison was made with the experimental data of Feng. The experimentally observed double amplitude response for an elastically mounted cylinder vibrating in the transverse direction are predicted and explained. Prediction of the model and experimental results agree within the range of experimental data scatter. Dissert. Abstr.

N82-10274 Lehigh Univ., Bethlehem, Pa.
SEISMIC RESISTANCE CHARACTERISTICS OF REINFORCED CONCRETE BEAM SUPPORTED FLOOR SLABS

IN BUILDING STRUCTURES Ph.D. Thesis
Masayoshi Nakashima 1981 352 p
Avail: Univ. Microfilms Order No. 8118842

The in-plane seismic characterics of reinforced concrete floor slabs which function as diaphragms placed between laternal load resisting systems are described. The testing of representing a portion of the floor system in a building structure were tested under various loading and support conditions is described. A non-linear finite element model which predicts the ultimate strenght of the test slab panel subjected to monotonic in-plane loading duplicates the experimental load-deflection curves, reproduces the unloading stiffness of the test slab panels is described. The effects of geometry, reinforcement, loading and support conditions on the in-plane characteristics of floor slabs were investigated. In the dynamic response analysis, a seven story and six bay symmetrical building model was selected in order to examine the influence of in-plane characteristics of floor slabs on the building response. Dissert. Abstr.

N82-10275# Air Products and Chemicals, Inc., Trexlertown, Pa.
LOAD-CHANGE TESTING OF A LARGE COMMERCIAL OXYGEN PLANT Final Report
N. Chatterjee, J. C. Sorensen, and A. J. Patrylak Apr. 1981 46 p refs
(EPRI Proj. 2806-1)
(EPRI-NP-1824) Avail: NTIS HC A03/MF A01

A series of transient response tests were successfully conducted on one of three 1,000 T/D oxygen production plants operated under computer control. These tests involved a series of rapid rate changes in oxygen production specified to simulate the varying demand for oxygen of a coal gasifier in combined cycle power generation service. Since the ability of the oxygen plant itself to rapidly change its gaseous production rate is an important element in the design and operation of gasification combined cycle) plants, a series of load following tests was arranged. The actual oxygen plant rate changes easily exceeded the targeted response rate with minimal variation in product oxygen purity. Oxygen production rate changes of +- 10 to +- 13% of design in 1 to 2 min were readily accomplished. The production rate was also varied over the full range from 70% to 105% of design at a continuous ramp rate of approximately 2% of design production per minute. DOE

N82-10276# Mid-American Solar Energy Complex, Minneapolis, Minn.
QUARTERLY REPORT OF SOLAR FEDERAL BUILDINGS PROGRAM IN THE MASEC REGION
Jun. 1981 20 p
(Contract DE-AC02-79CS-30150)
(DE81-027968; MASEC-R-81-059/1) Avail: NTIS HC A02/MF A01

Solar Federal Buildings Program (SFBP) projects within the 12-state MASEC region are listed. The states involved are Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin. The SFBP agencies projects are briefly described. DOE

N82-10277# Minnesota Univ., St. Paul. Underground Space Center.
EARTH SHELTER 2. 1979-1980 USC SERIES
1980 236 p refs Presented at the Earth Sheltered Housing Conf. and Exhibition, Minneapolis, 9-11 Apr. 1980; sponsored by the Underground Space Center of the Minnesota Univ. and the Am. Underground Space Association, and Minnesota Soc. Am. Inst. of Architects, and Minnesota Soc. of Professional Eng. Sponsored by DOE
(CONF-800438) Avail: NTIS HC A11/MF A01

Abstracts are presented of 22 conference papers which discuss criteria for constructing earth-sheltered structures for residential and commercial purposes. Aesthetics and the manipulation of form, space, and natural light are examined as well as ionizing radiation levels; legal liabilities in design, construction, and ownership; and the impact of restrictive covenants. The locations and energy conservation efficiency of 80 earth-covered structures in Oklahoma are also examined. A.R.H.

N82-10278# Centre Technique des Industries Mecaniques, St. Etienne (France).
FORMING TECHNIQUES AND PROCEDURES Final Report [NOUVEAUX PROCEDES DE MISE EN FORME]
F. Ronde-Oustau Sep. 1980 40 p In FRENCH
(CETIM-1-3K-15-0) Avail: NTIS HC A03/MF A01

Innovative or little known procedures which may improve the competitiveness of forged parts are reviewed. Topics covered incude: (1) cooling of stamping or die forging tools by 'Celoduc' (an evaporative closed circuit cooling system); (2) continuous casting; (3) flangeless and closed matrix stamping; (4) rotaform orbital forging; and (5) plastic deformation of cast spheroidal graphite. Author (ESA)

N82-10279# Ruhrkohle A.G., Essen (West Germany).
SAFETY AND TECHNICAL OPTIMIZATION OF BELT TRANSFER POINTS WITH SPECIAL CONSIDERATION FOR THE SUPPRESSION OF NOXIOUS AND EXPLOSIVE DUSTS Final Report
Albert Schade Bonn Bundesministerium fuer Forschung und Technologie Dec. 1980 71 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-HA-80-048; ISSN-0171-7618) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 14.90

A dust suppression installation and a dust monitoring instrument were laboratory tested and installed at belt transfer points in a coal plant where noxious and explosive dust develops by air separation, leading to considerable increases of concentration in subsequent operational areas. Usage of enclosed segment chutes is shown to reduce the dust load by 40%. A digital scattered light photometer in connection with a signal-controlled sprinkler installation lead to further dust diminution along with a reduction of the spray water volume by 30 to 50%. Generalization of usage of the present installation is advocated. Author (ESA)

N82-10280# Research Inst. of National Defence, Linkoeping (Sweden). Huvudavdelning 3.
ELECTRONIC CONTROL AND PROTECTIVE SYSTEMS FROM THE SAFETY POINT OF VIEW [ELEKTRONISKA STYR- OCH SKYDDSSYSTEM UR ARBETARSKYDDS-SYNPUNKT]
Mats Gunnerherd Nov. 1980 24 p refs In SWEDISH
(FOA-C-30205-E5) Avail: NTIS HC A02/MF A01

Results of a study to improve the type-classification of safety and driving systems for machine tools, related to electronic driving devices are presented. The change from electromechanics to electronics leads to many problems connected with labor safety. The possibilities of carrying through the safety recommendations given by a safety analysis must also be examined. Put to good use, electronics can give rise to labor safety. But there is a higher probability that dangerous drives or inadequate safety systems may appear on the market in spite of the checking, because electronic systems are difficult to analyze with regard to component errors and reliability. Author (ESA)

N82-10281# Acurex Corp., Mountain View, Calif. Energy and Environment Div.
INFRARED AND CATALYTIC BURNER TECHNOLOGY ASSESSMENT Final Report, 21 Feb. 1980 - 20 Feb. 1981
John P. Kesselring, W. V. Krill, and R. J. Schreiber Feb. 1981 163 p refs
(Contract GRI-5014-345-0283)
(PB81-222283; FR-80-72/EE; GRI-80-0019) Avail: NTIS HC A08/MF A01 CSCL 13A

A review of the state of the art in infrared and catalytic burner development shows that four basic types of IR burners are currently in use. Eight commercial and/or residential appliances were characterized to assess the applicability of these burners. The refractory monolith tile and the fiber matrix burners appear most applicable for appliance use. Conceptual designs for the eight appliances with IR burners were prepared to evaluate the technical feasibility. These appliances are shown to have significant fuel efficiency increase and NOx and CO emission reduction benefits. Four appliances -- the commercial rangetop, deep fat fryer, commercial water heater, and warm air furnance -- also

appear economically competitive, and recommended approaches for further development are presented. Lists of IR burner literature and patents are also presented. GRA

N82-10282# Indian Lead Zinc Information Centre, New Delhi.
PROCEEDINGS OF SOLDER SEMINAR
Nov. 1980 215 p refs Conf. held at Bangalore, India, 5-6 Nov. 1979
(PB81-120297) Avail: NTIS HC A10/MF A01 CSCL 13H

Contents: Solder systems; Soldering fluxes and techniques; Quality and testing; Standardization and safety; Soldering in electronics industry; Soldering in other industries. GRA

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

N82-10283 Polytechnic Inst. of New York, Brooklyn.
ASYMPTOTIC ANALYSIS OF PARABOLIC REFLECTOR ANTENNAS Ph.D. Thesis
Flavio Jose Vieira Hasselmann 1981 151 p
Avail: Univ. Microfilms Order No. 8118872

Dual mode horns employed commonly as feeds for parabolic reflector antennas generate a radiation pattern that can be well approximated by a Gaussian beam. Two procedures to determine the far field of the antenna which may contain multiple subreflectors, are reviewed and applied to a two-dimensional configuration comprising a parabolic reflector with offset beam feed centered and the focus. The scalar field results obtained from the two methods are shown to be equivalent. The complex-source-point method is adapted to the three-dimensional configuration and yields directly the depolarization and ellipticity of the reflected vector beam near or far from the reflector surface. Comparisons are made with results deduced elsewhere by a semiheuristic procedure, and with experimental data. The evanescent wave tracking analysis is extended to the vector fields encountered in the three-dimensional reflector configuration. The results here obtained are compared with those derived. Dissert. Abstr.

N82-10284 Polytechnic Inst. of New York, Brooklyn.
HIGH-FREQUENCY PROPAGATION IN ELEVATED TROPOSPHERIC DUCTS Ph.D. Thesis
Carlos Gustavo Migliora 1981 141 p
Avail: Univ. Microfilms Order No. 8118887

An analytical method combining a mixture of ray-optical fields and normal mode fields guided along the concave side of the duct boundary or between the duct boundary and the Earth's surface is described. The duct is modeled by two circular cylindrical boundaries representing, respectively, the Earth's surface and the interface separating the duct region (high refractive index) from the exterior. Excitation is from an electric current line source with time harmonic variation. After deriving the Green's function for the duct environment in an integral form, three different representations are obtained for the field; one involving only normal modes, one involving only geometric-optical rays and the hybrid ray-mode representation that includes rays, modes, and some remainder integrals that are shown to be negligible in most cases. Field values are then computed. The number of rays and modes included in the hybrid solution is determined. Dissert. Abstr.

N82-10285 Polish Academy of Sciences, Warsaw. Inst. Podstawowych Problemow Techniki.
PROCESSING AND DECODING THE SIGNAL IN SPEECH PERCEPTION
Piotra Lobacz 1981 96 p refs
(ISSN-0208-5658) Copyright. Avail: Issuing Activity

An attempt is made to summarize systematically present day knowledge of speech processing by man with a view to its inclusion in automatic systems in which word recognition is preceded by phoneme identification. It is suggested that the most interesting models are those which assume parallel processing in several blocks, interaction between bottom up and top down procedures, decoding phonemes on the basis of distinctive features, categorical character of perception at the segment level, and the acceptance of the lexeme as the basic element of recognition. Several theoretical approaches to the models are discussed and the following distinctions between the models are made: hierarchical vs. parallel and passive vs. active. T.M.

N82-10286*# National Aeronautics and Space Administration. Pasadena Office, Calif.
SYNTHETIC APERTURE RADAR TARGET SIMULATOR Patent Application
Howard A. Zebker (JPL, California Inst. of Technology, Pasadena), Daniel N. Held (JPL, California Inst. of Technology, Pasadena), Richard M. Goldstein (JPL, California Inst. of Technology, Pasadena), and Thomas C. Bickler, inventors (to NASA) (JPL, California Inst. of Technology, Pasadena) Filed 17 Jul. 1981 15 p
(Contract NAS7-100)
(NASA-Case-NPO-15024-1; US-Patent-Appl-SN-284287) Avail: NTIS HC A02/MF A01 CSCL 17I

A simulator for simulating the radar return, or echo, from a target seen by a SAR antenna mounted on a platform moving with respect to the target is described. It includes a first-in first-out memory which has digital information clocked in at a rate related to the frequency of a transmitted radar signal and digital information clocked out with a fixed delay defining range between the SAR and the simulated target, and at a rate related to the frequency of the return signal. An RF input signal having a frequency similar to that utilized by a synthetic aperture array radar is mixed with a local oscillator signal to provide a first baseband signal to provide a first baseband signal having a frequency considerably lower than that of the RF input signal. T.M.

N82-10287*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
FOCAL AXIS RESOLVER FOR OFFSET REFLECTOR ANTENNAS Patent Application
Richard F. Schmidt, inventor (to NASA) Filed 2 Oct. 1981 20 p
(NASA-Case-GSC-12630-1; US-Patent-Appl-SN-308009) Avail: NTIS HC A02/MF A01 CSCL 20N

A method and apparatus for determining the focal axis of an asymmetrical antenna (such as an offset paraboloid reflector) are described. A transmitting feed horn array is located at the known focal point of an offset reflector antenna and aligned with an estimated focal axis of the antenna. The array is coupled to an amplitude or phase comparison feed circuit which is adapted to provide sum and difference output fields. The feed horn array is rotated in discrete steps in at least one plane about an axis through the focal point of the antenna. At each step the far field radiation is received and detected in amplitude and the minimum value of the difference pattern at each step is noted. An indication of the true focal axis is provided by the extreme values of difference signal or the relative phase difference. M.G.

N82-10288*# Massachusetts Inst. of Tech., Cambridge.
PHASE-A COBE STUDY Final Report
Dec. 1978 57 p refs
(NASA-TM-84037) Avail: NTIS HC A04/MF A01 CSCL 20N

A scaled version of a conical apodizing horn similar to the one used in the Cosmic Background Explorer as the antenna for the far infrared absolute spectrometer (FIRAS) was tested to determine its diffraction patterns. The test transmitter used and results are described. Calculation of the tradeoff between noise and spectral resolution for the FIRAS are examined. Flexural transports, the optical properties of the Martin-Pupplet polarizing interferometer, and radiation absorption of thin bismuth films are also discussed. A.R.H.

N82-10289*# Computer Technology Associates, Inc., Seabrook, Md.
INTEGRATED COMMAND, CONTROL COMMUNICATION AND COMPUTATION SYSTEM STUDY Final Report

Aug. 1981 73 p refs
(Contract NAS5-26239)
(NASA-CR-166738) Avail: NTIS HC A04/MF A01 CSCL 17B

The study was conducted in three phases: a functional requirements phase; a functional architecture phase; and a design plan phase. The major emphasis was on the functional architecture phase and the approaches used for its functional hierarchy, operations concept, and interfaces. T.M.

N82-10290*# Computer Technology Associates, Inc., Seabrook, Md.
INTEGRATED COMMAND, CONTROL, COMMUNICATIONS AND COMPUTATION SYSTEM FUNCTIONAL ARCHITECTURE
C. G. Cooley and L. E. Gilbert 17 Aug. 1981 188 p refs
(Contract NAS5-26239)
(NASA-CR-166739) Avail: NTIS HC A09/MF A01 CSCL 17B

The functional architecture for an integrated command, control, communications, and computation system applicable to the command and control portion of the NASA End-to-End Data. System is described including the downlink data processing and analysis functions required to support the uplink processes. The functional architecture is composed of four elements: (1) the functional hierarchy which provides the decomposition and allocation of the command and control functions to the system elements; (2) the key system features which summarize the major system capabilities; (3) the operational activity threads which illustrate the interrelationahip between the system elements; and (4) the interfaces which illustrate those elements that originate or generate data and those elements that use the data. The interfaces also provide a description of the data and the data utilization and access techniques. R.J.F.

N82-10291# Committee on Science and Technology (U. S. House).
COMMUNICATIONS RESEARCH AND DEVELOPMENT
Washington GPO 1980 40 p Presented by the Subcomm. on Transportation, Aviation and Commun., and the Subcomm. on Sci., Res., and Technol. of the Comm. on Sci. and Technol., 96th Congr., 2nd Sess., Dec. 1980
(GPO-68-874) Avail: Subcommittee on Transportation, Aviation and Communications

The role of the FCC in the development and application of telecommunications technology is discussed. Trends in communications technology, FCC's role in assessing public interest developments and applications, mechanisms available to the FCC for implementing its role, and relationships between FCC and other organizations are considered. The merger of data processing and communications in terms of FCC's regulatory responsibility and the decision that with the exception of ATT and GTE there is no problem in this interface, and that this should not be a subject of FCC regulation is discussed. The regulatory role of the FCC is described. J.D.H.

N82-10292# Lincoln Lab., Mass. Inst. of Tech., Lexington.
RADAR PROPAGATION AT LOW ALTITUDES: A REVIEW AND BIBLIOGRAPHY
M. Littleton Meeks 31 Jul. 1981 140 p
(Contract F19628-80-C-0002; ARPA Order 3724)
(AD-A103773; TR-580; ESD-TR-81-98) Avail: NTIS HC A07/MF A01 CSCL 17/9

This report reviews the subject of electromagnetic wave propagation near the Earth's surface as it relates to the detection of low-flying aircraft by ground-based radars. Separate sections describe how current knowledge of the three fundamental physical phenomena - refraction, reflection, and diffraction - is applied to the problems of low-altitude propagation. Simple models incorporating these phenomena are discussed: (1) propagation over a plane with arbitrary reflection coefficient, (2) propagation over a knife-edge on a plane, and (3) propagation over a smooth, spherical earth. Computer programs for models (2) and (3) are given in the Appendices. We include a bibliography of the literature on which this report is based: books, journal articles, and technical reports. References are listed alphabetically by first author, and subject indices are given for major subject headings. Author (GRA)

N82-10293# Electronics Engineering Group (1842nd), Scott AFB, Ill.
SCINTILLATION EFFECTS, MITIGATIONS AND RECOMMENDATIONS FOR AFSATCOM AND OTHER SATELLITE COMMUNICATIONS SYSTEMS
Edwin H. Chapin Jun. 1981 44 p refs
(AD-A104149; Rept-1842-EEG/EETTW-TR-81-8) Avail: NTIS HC A03/MF A01 CSCL 20/14

Signal propagation disturbances, such as scintillations, seriously degrade or disrupt operational performance of AFSATCOM and other satellite communication links. The ionospheric irregularities which cause these disturbances may develop in either a natural or nuclear environment. Natural scintillations correlate with location, time of day, season and solar activity, and are particularly disruptive to airborne (SIOP) communications terminals. The disruptions are expected to peak in the early 1980's, near the crest of the 11 year solar activity cycle. Nuclear detonations can produce a combination of absorption and intense scintillation extending over a CONUS size region for several hours at UHF, and somewhat less at SHF. The report discusses both types of scintillation, noting the analogous equations governing density functions in the two regimes, outlines mitigation strategies, reviews Air Force involvement and offers recommendation for a coordinated and integrated AF effort. The AFCC/1842 EEG mission requirements, to perform system engineering, consultative assistance to MAJCOMs, and collaboration in research and development is reviewed and recommendations are made as to method to meet these requirements.
Author (GRA)

N82-10294# Michigan State Univ., East Lansing. Div. of Engineering Research.
RADAR WAVEFORM SYNTHESIS FOR TARGET IDENTIFICATION Final Report, 5 May 1980 - 4 May 1981
Kun-Mu Chen 3 Jun. 1981 81 p refs
(Contract N00019-80-K-0382)
(AD-A103805) Avail: NTIS HC A05/MF A01 CSCL 17/9

A new scheme for radar detection and discrimination, the radar waveform synthesis method, is investigated. This scheme consists of synthesizing an aspect-independent waveform for the incident radar signal which excites an arbitrarily oriented target in such a way that the return radar signal from the target contains only a single natural resonance mode of the target in the late-time period. When the synthesized incident radar signal for exciting a particular natural mode of a known, preselected target is applied to a wrong target, the return radar signal will be significantly different from that of the expected natural mode, thus, the wrong target can be sensitively discriminated. The selection of an optimum pulse duration of the required incident signal for the purpose of shaping its waveform is also studied. Three kinds of targets, an arbitrarily oriented thin wire, a sphere and a normally oriented infinite cylinder, have been investigated. The cases of an arbitrarily oriented wire and a sphere have been completed and the results are reported in Parts 1 and 2. The case of infinite cylinder will be completed shortly and incomplete results of this case are outlined in Part 3. Author (GRA)

N82-10295# Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision Systems.
A BUSY-TONE-MULTIPLE-ACCESS-TYPE SCHEME FOR PACKET-RADIO NETWORKS
Moshe Sidi (Technion - Israel Inst. of Tech.) and Adrian Segall (Technion - Israel Inst. of Tech.) Jun. 1981 20 p refs Presented at Intern. Conf. on Performance of Data Commun. Systems and Their Appl., Paris, Sep. 1981 Submitted for publication
(Contract N00014-77-C-0532; NR Proj. 041-519)
(AD-A103825; LIDS-P-1103) Avail: NTIS HC A02/MF A01 CSCL 17/2

We consider a packet radio network whose stations share a communication channel and work with an algorithm similar to the busy-tone-multiple-access protocol of ALOHA systems. In this context, two problems are treated: distributed routing and bandwidth allocation. Author (GRA)

N82-10296# Texas Univ., Austin. Center for Particle Theory.
DIRAC'S NEW RELATIVISTIC WAVE EQUATION IN INTERACTION WITH AN ELECTROMAGNETIC FIELD
N. Mukunda, C. C. Chiang, and E. C. G. Sudarshan May 1981

11 p refs
(Contract DE-AC05-76ER-03992)
(DE81-028472; DOE/ER-03992/448) Avail: NTIS HC A02/MF A01

The Dirac equation of 1971 was made to provide wave equation for a spinless particle of finite mass capable of interacting with the electromagnetic field. The inconsistency of Dirac's equation was avoided by developing a more complex structure for the particle. DOE

N82-10297# New Mexico State Univ., Las Cruces. Physical Science Lab.
DEVELOPMENT OF LARGE CYLINDRICAL STRIPLINE ANTENNA ARRAYS Final Report, Feb. 1978 - Jan. 1981
Henry D. Weinschel and Al Waterman Hanscom AFB, Mass. AFGL Jun. 1981 65 p
(Contract F19628-78-C-0052; AF Proj. 7659)
(AD-A104190; PD-00990; AFGL-TR-8100181) Avail: NTIS HC A04/MF A01 CSCL 09/5

Studies included the development stripline telemetry antenna arrays for large diameter missiles, electrically small antennas at 550 MHz, and encapsulated S-Band antennas for small spherical satellites. Author (GRA)

N82-10298# Research Inst. of National Defence, Linkoeping (Sweden). Huvudavdelning 3.
HARMONIC RADAR LITERATURE [HARMONISK RADAR - EN LITTERATURSTUDIE]
Boerje Jansson Jul. 1980 35 p refs In SWEDISH
(FOA-C-30194-E1(E3)) Avail: NTIS HC A03/MF A01

A harmonic radar sends on a given frequency f sub o and receives on another frequency usually 3 f sub o. The overtone is generated on joints between the metal parts of the radar target. The generated high harmonic frequency is very weak, which is why this radar has an extremely low range of detection. Natural objects in the target area do not disturb the high frequency harmonics. The radar becomes clutter free. The principals of generating high frequency harmonics cover tunneling, semiconductor and microwave effects. Signal generation is most powerful when f sub o is between 100 and 1000 MHz. Author (ESA)

N82-10299# Research Inst. of National Defence, Linkoeping (Sweden). Huvudadvelning 3.
METHODS FOR AUTOMATIC TARGET TRACKING AND PLOT-TARGET ASSOCIATION. REVIEW OF THE LITERATURE [METODER FOER AUTOMATISK MAALUPPTAECKT OCH PLOTT-MAALASSOCIERUNG LITTERATURESTUDIE]
Rune Thors Aug. 1980 187 p refs In SWEDISH
(FOA-C-30199-E1) Avail: NTIS HC A09/MF A01

Methods for checking the performance of alternatives to given tracking method in different environments are considered. Alternatives to the track split method are described, especially target tracking of aircraft flying in group formations. Tracking filters proposed for use in very dense environments are examined. Simulation performances and calculation requirements are discussed. Author (ESA)

N82-10300# Research Inst. of National Defence, Linkoeping (Sweden). Huvudavdelning 3.
BROADBAND RADAR: PRINCIPLES AND METHODS OF JAMMING [BREDBANDSRADAR: PRINCIPER OCH STOERMOEJLIGHETER]
Per Hyberg Dec. 1980 234 p refs In SWEDISH
(FOA-A-30023-E4) Avail: NTIS HC A11/MF A01

Different jamming methods are discussed. A chart shows how to choose the most appropriate jammer according to the type of broadband radar required. Author (ESA)

N82-10301# Research Inst. of National Defence, Stockholm (Sweden). Huvudavdelning 1.
EXPERIENCE WITH THE TELECONFERENCE SYSTEM KOM [ERFARENHETER AV ANVAENDNING AV TELEKONFERENSSYSTEMET KOM]
Jacob Palme, Lillemor Adrianson, Martin Nilsson, Tommy Nilsson, Anders Sandberg, Torgny Tholerus, and Mats Wallin Dec. 1980 131 p In SWEDISH
(FOA-C-10166-M6(H9)) Avail: NTIS HC A07/MF A01

The frequency and object of use of KOM are described. Users opinions are reported. Cost is compared with other communications systems. Author (ESA)

N82-10302# Research Inst. of National Defence, Linkoeping (Sweden). Huvudavdelning 3.
WEIGHTED LINEAR DISPERSIVE RETARDATION LINES: CALCULATIONS FOR THE OUT-SIGNAL TIME FUNCTION WHERE THE IN-SIGNAL IS AN ALMOST MATCHING LINEAR FREQUENT SINE-SIGNAL [VIKTADE LINJAERT DISPERSIVA FOERDROEJNINGSLEDNINGAR: BERAEKNINGAR AV UTSIGNALENS TIDSFUNKTION NAER INSIGNALEN AER EN NAESTEN MATCHANDE LINJAERT FREKVENSSVEPT SINUSSIGNAL]
Rickard Wallden Nov. 1980 30 p In SWEDISH
(FOA-C-30202-E4) Avail: NTIS HC A03/MF A01

Calculation of the out-signal from a linear dispersive retardation line with two different types of small nonmatching sloped in-signal is discussed. On the one hand, an example of an in-signal of which the frequency/time characteristics deviate somewhat from the characteristics suited to the line, on the other hand a pulsed in-signal, not filling-up the line are considered. The background for these calculations is briefly indicated. Results are given as time-diagrams, with explanations. Author (ESA)

N82-10303# Research Inst. of National Defence, Linkoeping (Sweden). Huvudavdelning 3.
CONSTRUCTION OF AN AM DEMODULATOR FOR BROADBAND MODULATION SIGNALS [BREDBANDIG AM-LAENK]
Anders Kaelldahl Dec. 1980 64 p refs In SWEDISH
(FOA-C-30209-E4) Avail: NTIS HC A04/MF A01

The construction of an AM demodulator for broadband modulation signals is described. Design of an automatic gain control device is detailed. Low cost components and construction methods were used. Entry dynamics of 45 dB with a signal to noise ratio over 20 dB, regardless of the position on the dynamics curve was achieved. Author (ESA)

N82-10304# Engins Matra, Velizy (France).
SPECTRAL ANALYSIS USING THE FAST FOURIER TRANSFORMATION [L'ANALYSE SPECTRALE PAR LA TRANSFORMATION DE FOURIER RAPIDE]
Thierry Moreira 24 Apr. 1981 115 p refs In FRENCH
(Rept-100-81) Avail: NTIS HC A06/MF A01

The Fourier transformation was studied, emphasizing applications in signal analysis. A diminution in run time when calculating the power spectrum of a signal was sought. The utilization of the method is only valid for finding the general nature of spectral oscillations, to the exclusion of any quantitative measure. As a general rule, the calculation method based on the autocorrelation function remains the most effective. As a corollary result, a computer calculation program for the fast Fourier transformation is presented. Author (ESA)

N82-10305# Technical Research Centre of Finland, Espoo. Telecommunications Lab.
INTRODUCTION TO PROGRAM DEVELOPMENT RULES [JOHDATUS OHJELMIEN KEHITYSSAEAENTOEIHIN]
Vaeinoe Maksimainen and Jorma Hirvensalo May 1981 29 p refs In FINNISH; ENGLISH summary
(VTT-48; ISBN-951-38-1195-6; ISSN-0355-368X) Avail: NTIS HC A03/MF A01

Rules for constructing mini and microcomputer programs for switching systems were developed. Specification, design, implementation, and installation and operation are covered. Specification includes definition of the system requirements, and rules for defining the software under development. The design phase consists of guidelines for data structuring, modularizing, and refining of outlines into detailed design documents. The implementation rules indicate how to code, tests, and debug the program. The installation and operation phase transfers the program into the target system. Guidelines for implementing quality control and documentation are given. Author (ESA)

N82-10306# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
ELECTROMAGNETIC COMPATIBILITY

Aug. 1981 131 p refs Lecture held in Bolkesjo, Norway, 31 Aug. - 1 Sep. 1981, in Munich, 3-4 Sep. 1981, and in Rome, 7-8 Sep. 1981
(AGARD-LS-116; ISBN-92-835-1396-7) Avail: NTIS HC A07/MF A01

Various aspects of electromagnetic compatibility (EMC) are presented. The major focus is on impact of the increasing complexity and density of avionics systems on the special demands of those responsible for achieving EMC within host weapon platforms. For individual titles, see N82-10307 through N82-10313.

N82-10307# Rome Air Development Center, Griffiss AFB, N.Y.
THE EMC CONCEPT FOR WEAPON SYSTEMS
John F. Spina *In* AGARD Electromagnetic Compatibility Aug. 1981 9 p refs (For primary document see N82-10306 01-32)
Avail: NTIS HC A07/MF A01

Electromagnetic compability (EMC) is discussed as it pertains to various weapon systems. The focus is on those weapon systems where the density of electronics is such that EMC must be reconed. Several weapon system EMC solution methods are also discussed. The status of computer aided EMC analysis techniques is given. R.C.T.

N82-10308# Syracuse Univ., N. Y. Dept. of Electrical and Computer Engineering.
EMC ANALYSIS AT THE SYSTEM LEVEL
Donald D. Weiner *In* AGARD Electromagnetic Compatibility Aug. 1981 22 p (For primary document see N82-10306 01-32)
Avail: NTIS HC A07/MF A01

A computer program is described which determines whether signals entering a receptor port from one or more emitters may cause interference. The characterization of emitter ports in terms of power spectral densities is discussed and narrowband and broadband components of the spectrum are defined. System compatibility is described in terms of electromagnetic interference margins. R.C.T.

N82-10309# Kentucky Univ., Lexington. Dept. of Electrical Engineering.
EMC ANALYSIS AT THE EQUIPMENT LEVEL
Clayton R. Paul *In* AGARD Electromagnetic Compatibility Aug. 1981 23 p refs (For primary document see N82-10306 01-32)
Avail: NTIS HC A07/MF A01

A summary of the techniques and problems involved in the assessment of the vulnerability of components of an electronic system is provided. Modeling emitters and receptors of electromagnetic energy are discussed as well as the predominant coupling paths (wire to wire, field to wire, and antenna to antenna). Various computer aided methods for evaluating the coupling are considered. R.C.T.

N82-10310# Rome Air Development Center, Griffiss AFB, N.Y.
AN INTRASYSTEM EMC ANALYSIS PROGRAM
Gerald T. Capraro *In* AGARD Electromagnetic Compatibility Aug. 1981 22 p refs (For primary document see N82-10306 01-32)
Avail: NTIS HC A07/MF A01

Various aspects of the intrasystem electromagnetic compatibility analysis program (IEMCAP) are discussed. Emphasis is placed on the input data requirements and coupling models contained in IEMCAP. The computer aspects and size constraints are given with helpful hints for the user on how to apply IEMCAP to systems whose size violates these constraints. Data are also provided showing the relative accuracy of IEMCAP's major coupling modes. Various modifications to IEMCAP are also presented. R.C.T.

N82-10311# Concordia Univ., Loyola Campus, Montreal (Quebec). Dept. of Electrical Engineering.
COMPUTER GRAPHIC AIDS TO WEAPON SYSTEMS EMC ANALYSIS
Stanley J. Kubina *In* AGARD Electromagnetic Compatibility Aug. 1981 13 p refs Sponsored in part by the Canadian Dept. of National Defense (For primary document see N82-10306 01-32)
Avail: NTIS HC A07/MF A01

The full potential of interactive computer graphics for the achievement of an unprecedented level of appreciation of the electromagnetic interference interaction elements are illustrated. Examples are taken from the computer code called advanced antenna to antenna coupling plus graphics. It is shown that the input modelling data used in the large, powerful electromagnetic compatibility codes can be presented as comprehensive images of the aircraft or the system port characteristics. It is further shown that the results can be presented in a format which makes visible the constituent components that produce the images. R.C.T.

N82-10312# Royal Aircraft Establishment, Farnborough (England).
THE EMC TESTING OF AIRCRAFT EQUIPMENT
N. J. Carter *In* AGARD Electromagnetic Compatibility Aug. 1981 20 p refs (For primary document see N82-10306 01-32)
Avail: NTIS HC A07/MF A01

The repeatability and usefulness of the electronics in flight critical equipment were measured in terms of their effectiveness in aiding aircraft clearance. Specific emphasis was placed on the electromagnetic compatibility requirements of military aircraft. R.C.T.

N82-10313# Aeritalia S.p.A., Caselle Torinese (Italy). Gruppo Equipaggiamenti.
A NEW APPROACH TO EMC SYSTEM TESTING
B. Audone *In* AGARD Electromagnetic Compatibility Aug. 1981 8 p refs (For primary document see N82-10306 01-32)
Avail: NTIS HC A07/MF A01

An approach is described which encompasses the quantitative measurement of electromagnetic compatibility of aircraft equipment. The general testing philosophy is explained and a series of generally applicable test methods are described. R.C.T.

N82-10314 Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
THE FINITE ELEMENT METHOD APPLIED TO THE SYSTEM-GENERATED ELECTROMAGNETIC PULSE BOUNDARY LAYER Ph.D. Thesis
John Alfred Gaudet 1981 145 p
Avail: Univ. Microfilms Order No. 8119137

Use of the finite element method to solve the nonlinear electron plasma equations for the system-generated electromagnetic pulse boundary layer in one spatial dimension is described. These equations were solved in distance velocity phase space using a rectangular finite element mesh. Linear approximations were used for both the trial and weight functions for each element. The advection terms in the Vlasov plasma equation were treated with the Heinrich upwinding technique. The time integration was performed using an explicit two-step Lax-Wendroff procedure. The system of algebraic equations was solved with a fully-packed Gauss-Seidel iteration scheme. A value of 2/3 for the upwinding parameter was found to provide the best compromise between dispersion of the pulse and computer storage requirements. The savings in computer memory results in increased execution speed for the algorithm. Also, it is shown that the numerical scheme does not permit spurious pulse reflections from the edges of the mesh. Results for several test cases are presented. Dissert. Abstr.

N82-10987# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
A SYNTHESIS TECHNIQUE FOR ARRAY ANTENNAS OF HIGH DIRECTIVITY AND LOW SIDELOBE
Wan Wei, Huang Jingxi, and Hu Shiming *In its* Recent Selected Papers of NW Polytech. Univ., pt. 1 (FTD-ID(RS)T-0259-81-Pt-1) 20 Aug. 1981 p 132-155 refs Transl. into ENGLISH from Recent Selected Papers of NW Polytech. Univ., pt. 1 (Xian Shaanxi), 1979 (For primary document see N82-10980 01-99)
Avail: NTIS HC A17/MF A01

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics*.

N82-10315 Southern Methodist Univ., Dallas, Tex.
STATISTICAL CHARACTERIZATION OF LOGIC CIRCUIT TIMING PARAMETERS Ph.D. Thesis
Harold Dean Camp 1981 214 p
Avail: Univ. Microfilms Order No. 8119136

Several methods of characterizing logic timing parameters are investigated. Device characterization studies are inspected and it is seen that propagation delays for the TTL logic family follow Gaussian distributions. A method of timing analysis is developed which uses the Gaussian timing delays and the central limit theorem to approximate the propagation delays for a logic circuit composed of several levels of gate delays. This method relies on accurate timing distributions for each gate type in the circuit as an input to the procedure. In an attempt to obtain accurate timing distributions for gate and logic circuits, a method of computer analysis of digital circuits is developed. It is shown that the resultant timing parameter distributions have Gaussian characteristics for all four logic families investigated. The central limit theorem is shown to apply to both the TTL and ECL logic families. Dissert. Abstr.

N82-10316 California Inst. of Tech., Pasadena.
TOPICS IN THE ANALYSIS, MEASUREMENT, AND DESIGN OF HIGH-PERFORMANCE SWITCHING REGULATORS Ph.D. Thesis
Arthur Raymond Brown 1981 236 p
Avail: Univ. Microfilms Order No. 8119587

The high frequency capabilities of two switching regulator modeling techniques, state space averaging, and discrete modeling, are compared, using the subharmonic instability in current programmed regulators as a test. As a result of this comparison, a small signal, linear, time invariant modeling technique, called sampled-data modeling, was developed. This method retains the continuous form of state space averaging but also possesses the accuracy of discrete modeling, and thus it combines features of the two techniques. The sampled data modeling technique was applied to the question of the interpretation of loop gain measurements in high performance switching regulators. Dissert. Abstr.

N82-10317 Carnegie-Mellon Univ., Pittsburgh, Pa.
ITERATIVE ELECTRO-OPTIC MATRIX PROCESSOR Ph.D. Thesis
Mark Joseph Carlotto 1981 196 p
Avail: Univ. Microfilms Order No. 8118788

An electro-optic vector matrix processor with electronic feedback is described. The iterative optical processor (IOP) is designed for the rapid solution of linear algebraic equations. The IOP and the iterative algorithm it realizes are analyzed and simulated. A version of the system was fabricated using advanced solid state light sources and detectors plus fiber optic technology, and its performance is evaluated. An extension of the system using wavelength multiplexing is developed and the basic system concepts demonstrated. Its use in the restoration of degraded images or signals (deconvolution) and the computation of matrix eigenvectors and eigenvalues and matrix inversion are demonstrated. The two major case studies pursued are: adaptive phased array radar processing and optimal control. In the former case, the system is used to compute the adaptive antenna weights for a radar system. In the latter case, the IOP solves the linear quadratic regular and algebraic Ricatti equations of modern control theory. Dissert. Abstr.

N82-10318 Polytechnic Inst. of New York, Brooklyn.
A DYNAMIC ROUTING SCHEME IN PACKET SWITCHING NETWORKS Ph.D. Thesis
Paul Hua-Nien Chu 1981 166 p
Avail: Univ. Microfilms Order No. 8118867

The nodal as well as the network delay performance were analyzed and simulated. A nodal model under the dynamic routing scheme was constructed. This is diffferent from most other existing models where each link at a node is modeled separately. Results show that, given adequate traffic and traffic utilization at a node, the nodal delay performance under the routing strategy is better than that of a fixed routing strategy. The ratio of the delay performances approaches 1/n as the traffic load approaches unity. This result is insensitive to the service disciplines employed at the node. Dissert. Abstr.

N82-10319 Carnegie-Mellon Univ., Pittsburgh, Pa.
SYNTHETIC FILTERS FOR MULTICLASS PATTERN RECOGNITION Ph.D. Thesis
Charles Franklin Hester 1981 239 p
Avail: Univ. Microfilms Order No. 8118790

The recognition of an object from infrared imagery independent of the aspect viewing angle using one or only a few matched spatial filters is considered. A formulation of matched spatial filters as discriminant surfaces in hyperspace and consideration of multi-channel hyperplane filering are advanced. Selection and formation of synthetic discriminants that decorrelate input training set data by Fourier-Kernel, Gram-Schmidt, and Karhunen-Loeve decomposition are described. Bandpass filtering and preprocessing techniques such as non-unitary transforms for data decorrelation and maximum common information transformations are advanced to provide increased discrimination and improved system performance. Dissert. Abstr.

N82-10320 Texas Univ. at Arlington.
ANALYSIS AND SYNTHESIS OF LINEAR SHIFT-VARIANT DIGITAL FILTERS Ph.D. Thesis
Nian-Chyi Huang 1981 109 p
Avail: Univ. Microfilms Order No. 8119306

A framework for the analysis and synthesis of linear shift-variant (LSV) digital filters in both time and frequency domains is developed. The interrelationships among the impulse response, the shift-variant difference equation and the generalized transfer function of an LSV digital filter were investigated. The necessary and sufficient conditions for realizing an impulse response and a rational generalized transfer function as recursive shift-variant difference equations are derived. An LSV digital filter is applied to modify the short-time spectrum of a nonstationary sequence. It is shown that the shift-variant hort-time spectral modification can be implemented using a nonrecursive LSV digital filter, providing a frequency-domain interpretation of shift-variant filtering process. Problems associated with the synthesis and implementation of recursive LSV digital filters are investigated. Dissert. Abstr.

N82-10321 Arizona Univ., Tucson.
AUTOMATED DESIGN OF TWO-ZERO RATIONAL CHEBYCHEV FILTERS Ph.D. Thesis
Kha Hien Le 1981 111 p
Avail: Univ. Microfilms Order No. 8118451

The Rational Chebychev function is used to design elliptic-characteristic filters. The filter has N/2 ripples in the passband but only one ripple in the stopband for all orders. As N increases from three, the result is a substantial saving in number of capacitors in the passive ladder realization of the above function as compared to that of traditional elliptic filters of the same order N. The ladder's element values can be expressed as explicit involving only the coefficients of the transfer function. These expressions can also be used for other types of filters. Numerically, the design can be carried out by a FORTRAN program of a set of programs on a programmable calculator. The user needs only to give the three specifications: the filter order N, the stopband zeros Z, and the passband ripple amount R sub p. The program automatically selects the starting point for the given case and proceeds. The numerical results of the above programs over a range of specifications relate the above specifications to the minimum stopband attenuation. Dissert. Abstr.

N82-10322 Case Western Reserve Univ., Cleveland, Ohio.
IMPLANTABLE INTRACRANIAL PRESSURE TELEMETER USING CUSTOM INTEGRATED CIRCUITS Ph.D. Thesis
Albert May Pun Leung 1981 234 p
Avail: Univ. Microfilms Order No. 8118626

The design, fabrication, and evaluation of an implantable intracranial pressure (ICP) telemetry transmitter is described. Data transmission is accomplished by means of a radio frequency (RF) link. A silicon piezoresistive pressure transducer is used. Electrostatic bonding of this transducer onto a tubular glass support provides long-term stability, stress isolation and a hermetic package. Pressure baseline stability of better than 2 mm Hg/month has been achieved. Pulse code modulation is employed in the pressure channel to assure accurate data transmission. Low duty cycle pulse powering technique lowers the power consumption of the telemeter to only 0.3 mW. The complexity of the electronics is reduced by the use of a custom integrated circuit (PM2) which is a 40-pin bipolar device measuring 150 mil x 150 mil. It contains 75 NPN transistors, 26 PNP transistors, 45 base resistors (480 K total) and 16 pinch resistors (560 K total). The operating characteristics of the telemeter are described.
Dissert. Abstr.

N82-10323 Polytechnic Inst. of New York, Brooklyn.
CCD/MOS SAMPLED ANALOG LMS ADAPTIVE SIGNAL PROCESSOR Ph.D. Thesis
Subinoy Mazumdar 1981 138 p
Avail: Univ. Microfilms Order No. 8118886

An all analog adaptive signal processor applying the least mean square error algorithm is described. This processor is primarily a transversal filter. A simple MOSFET multiplier is developed in conjunction with a bidirectional charge integrator, providing advantages in speed, cost, power consumption, and weight over digital and hybrid adaptive processors. A feasibility study of different analog multipliers for use in an analog adaptive processor, an analysis of the errors introduced by the various devices are presented. The effects of these errors on the processor performance are considered. The processor compensates for the errors introduced by most of the components except for any offset error introduced by the tap weight charge integrator and by the comparator that detects the difference between the reference signal and the processor output. Applications for the processor are outlined. Dissert. Abstr.

N82-10324*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
TUNED ANALOG NETWORK Patent Application
Everett John Pyle, Jr., inventor (to NASA) Filed 10 Sep. 1981 14 p
(NASA-Case-GSC-12650-1; US-Patent-Appl-SN-301077) Avail: NTIS HC A02/MF A01 CSCL 09C

A non-inverting, direct current amplifier stage is cascaded into an integrator stage to form a two stage tuned network having a single input junction common to both stages. The network provides independent adjustment of center frequency, bandwidth and voltage gain. The insertion of a positive feedback loop between the stages provides a very narror bandwidth network. The addition of back-to-back Zener diodes between the common input node and ground converts the network into an oscillator. NASA

N82-10325*# Fairchild Weston Systems, Inc., Archbald, Pa.
MODIFICATIONS TO CTVS TV CAMERAS FOR SPACE SHUTTLE COMPATIBILITY AND EVALUATION Final Report
K. Hoagland Aug. 1981 36 p
(Contract NAS9-16228)
(NASA-CR-161087; ED-AX-225) Avail: NTIS HC A03/MF A01 CSCL 09A

Five all solid state cockpit television system (CTVS) cameras, built to USAF requirements for high performance type F-16 aircraft, were modified and tested for possible use in the closed circuit television system on the space shuttle orbiter. The 400 HZ power supply in the electronics unit assembly was replaced with two DC/DC converters to enable operation from 28VDC spacecraft-type power sources. Nonessential circuit functions were deleted to minimize input power requirements. The normal 31 mm focal length lense assemblies were replaced with wider field-of-view 19 mm focal length lenses. Base plates for and housings were redesigned to facilitate mounting and heat-sinking of the camera in the space environment and short length (14') adapter cables were designed, fabricated, and tested to meet requirements for cameras configured to mount on the astronauts helmet/visor assembly. Technical requirements, design implementation, environmental tests, Modifications prodedures, and reliability/quality efforts are discussed. Schematics are included. A.R.H.

N82-10326# Boeing Military Airplane Development, Seattle, Wash. Mechanical/Electrical Systems Technology Dept.
ADVANCED AIRCRAFT ELECTRICAL SYSTEM CONTROL TECHNOLOGY DEMONSTRATOR. PHASE 1: REQUIREMENTS ANALYSIS AND CONCEPTUAL DESIGN Interim Technical Report, 1 Sep. 1980 - 28 Feb. 1981
G. L. Dunn, P. J. Leong, and I. S. Mehdi Jul. 1981 103 p refs
(Contract F33615-80-C-2004; AF Proj. 3145)
(AD-A103922; D180-25927-2; AFWAL-TR-81-2058) Avail: NTIS HC A06/MF A01 CSCL 09/3

In Task 1, the requirements for the electrical power system and the integrated power system control were defined. In Task 2, three conceptual designs for the electrical power system were prepared. Each design incorporated a different data bus architecture, integrated, hierarchical, and non-integrated dedicated. The three designs were evaluated for application to a two engine tactical aircraft. Processor and data bus loading were examined for each architecture. Based on the evaluation, the conceptual design based on the integrated architecture is recommended for preliminary design in Task 3, phase I. Author (GRA)

N82-10327# Stanford Univ., Calif. Electronics Labs.
A FAST TURN-AROUND FACILITY FOR VERY LARGE SCALE INTEGRATION (VLSI) Semiannual Technical Status Report, 1 Jul. - 31 Dec. 1980
James D. Meindl, James D. Plummer, Robert W. Dutton, R. Fabian Pease, and J. Beaudouin Fort Monmouth, N.J. Army Electronics Reseach and Development Command Jul. 1981 63 p refs
(Contract MDA903-80-C-0432; DARPA Order 4012)
(AD-A104000; DELET-TR-80-0432-1; SATSR-1) Avail: NTIS HC A04/MF A01 CSCL 09/5

In order to appreciate the critical hardware and software problems associated with the definition and design of very large scale integrated circuits or integrated systems including 1000 - 1,000,000 transistors in a single silicon chip, incisive experiments conducted with actual operating chips are indispensible. The objective of this project is to establish within a university research environment, a facility for the rapid execution of mask generation, wafer fabrication, and functional testing of user-generated custom I. C. designs. Author (GRA)

N82-10328# Stanford Univ., Calif. Electronics Labs.
A FAST TURN-AROUND FACILITY FOR VERY LARGE SCALE INTEGRATION (VLSI) Semiannual Technical Status Report, 1 Jan. - 30 Jun. 1980
James D. Meindl Fort Monmouth, N.J. Army Electronics Research and Development Command Jul. 1981 48 p refs
(Contract MDA903-80-C-0432; DARPA Order 4012)
(AD-A104001; DELET-TR-80-0432-2; SATSR-2) Avail: NTIS HC A03/MF A01 CSCL 09/5

Efforts were made to provide fast turn-around fabrication of silicon integrated circuits for the local VLSI design community. Many of the practical aspects of producing small numbers of custom designed integrated circuits with a short turn around time were persued. The major focus was focus on many of the facilities, equipment, and fabrication issues which affect our ability to fabricate and test these custom designed chips. R.C.T.

N82-10329# Ohio State Univ., Columbus. Dept. of Electrical Engineering.
FEASIBILITY STUDY OF THE USE OF AN ENVIRONMENTAL CHAMBER FOR THE EXAMINATION OF TRANSMISSION-LINE ELECTRIC FIELD AND CORONA EFFECTS Final Report
S. A. Sebo, R. V. DeVore, and D. G. Kasten Jul. 1981 48 p refs Sponsored by EPRI
(EPRI Proj. 68-6)
(DE81-903933; EPRI-EL-1953) Avail: NTIS HC A03/MF A01

The feasibility of tests in a 5m x 5m x 6m (length) environmental chamber related to ground level electric field strength, corona starting voltage, conductor surface conditions, corona mechanisms, corona losses, ozone emission, audible noise,

radio noise, and DC corona phenomena for changes in energizing voltages, geometry, conductor types and materials, and atmospheric conditions was reviewed. Environmental chamber design considerations and preliminary specifications are also outlined with a review of supply requirements and guidelines for instrumentation. DOE

N82-10330# Westinghouse Electric Corp., Pittsburgh, Pa.
LIGHT-FIRED THYRISTOR DEVELOPMENT Interim Report
E. S. Schlegel, E. C. Strycula, and L. R. Lowry Jul. 1981 96 p Sponsored by Electric Power Research Inst.
(EPRI Proj. 567-1)
(DE81-903932; EPRI-EL-1916) Avail: NTIS HC A05/MF A01

A light-fired thyristor switch was demonstrated in one phase of a static volts-amperes-reactive generator and is presently under extended testing. The building of this 13.8-kV, bidirectional, 1200-A rms, solid-state switch required the development of the thyristor element and its special package, a light system consisting of laser diodes and a light distribution harness, and a special monitoring and protecting control circuit to protect the switch against various conditions under which it might not function safely. The switch is entirely self-contained and replaces the electrically gated version with no need for changes in the circuit to which it is connected. The report gives details on the development of each of the novel parts of the system; on the testing of each part of the system; and on the building, installation, and early evaluation of the switch. DOE

N82-10331# University of Southern California, Los Angeles. Dept. of Electrical Engineering.
CONTAMINATION FLASHOVER OF HVDC INSULATORS Final Report
T. C. Cheng, C. T. Wu, and A. Rodriquez-Penz Aug. 1981 162 p refs Sponsored in part by EPRI
(EPRI Proj. 848-1)
(DE81-904213; EPRI-EL-2016) Avail: NTIS HC A08/MF A01

An integrated field and laboratory study was conducted to investigate the mechanism of flashover of contaminated insulators under high voltage, direct current conditions. Salient factors identified in the field studies were reproduced under simulated conditions in the laboratory for in-depth studies. The effects of each factor were studied. Newly discovered phenomena which occur during the flashover process, such as formation of clean zones and the deleterious effect of nitrates on insulating materials, were observed. Theories were formulated to explain the mechanisms involved in these pemomena. Electrochemical properties of contaminants and their effects on flashover process were examined. The relationship between single-component salts and multi-component salts as investigated. Voltage distribution along a string of insulators was studied. Insulator designs using capacitive grading were proposed and their advantages exploited. The new designs showed promising results in both computer analysis and initial laboratory studies. DOE

N82-10332# Los Alamos Scientific Lab., N. Mex.
BLUMLEIN LINE GENERATION OF LONG-PULSE, PRECISELY REGULATED WAVESHAPES FOR NONLINEAR RESISTIVE LOADS
W. A. Reass 1981 4 p Presented at the 3rd IEEE Intern. Pulsed Power Conf., Albuquerque, N. Mex., 1-3 Jun. 1981
(Contract W-7405-eng-36)
(DE81-025380; LA-UR-81-1670; CONF-810659-14) Avail: NTIS HC A02/MF A01

Criteria utilized in the design of a long-pulse, offset-tuned Blumlein line is characterized as capable of generating extremely high power, high voltage pulses with outstanding fidelity over a wide range of voltage driving a nonlinear resistive load. R.C.T.

N82-10333# Lincoln Lab., Mass. Inst. of Tech., Lexington.
DESCRIPTION OF BATTERY STATE-OF-CHARGE CONTROLLER
R. N. Cadieux May 1981 11 p refs
(Contract DE-AC02-77ET-20279)
(DE81-026294; DOE/ET-20279/T8; COO-4094-82) Avail: NTIS HC A02/MF A01

A controller was designed to meet the requirements of an off-peak, stand-alone solar photovoltaic power system. Design requirements, physical description, circuit description, theory of operation and operation procedures are presented. DOE

N82-10334# Massachusetts Inst. of Tech., Cambridge. Energy Lab.
INTEGRATION OF DECENTRALIZED GENERATORS WITH THE ELECTRIC POWER GRID
Susan Finger Apr. 1981 193 p refs
(Contract DE-AM01-76EI-02295)
(DE81-029731; MIT-EL-81-011) Avail: NTIS HC A09/MF A01

The economic interactions of customer-owned electrical generators with the central electric power grid was studied. The reciprocal effects of the operation and expansion plans of the utility, and the resulting price of electricity, and the demand patterns and expansion plans of customers are discussed. The system is modeled in an open-loop feedback mode that allows both the utility and the customers to update their plans and expectations for the next time period based on the other's actions in the current time period and based on any new information such as the current time period and based on any new information such as the current price of oil. The utility and the customers solve similar operation and expansion problems, except that each has control over different variables. DOE

N82-10335# Los Alamos Scientific Lab., N. Mex.
PULSE POWER APPLICATIONS OF FLUX COMPRESSION GENERATORS
C. M. Fowler, R. S. Caird, D. J. Erickson, and B. L. Freeman 1981 9 p refs Presented at the IEEE Pulse Power Conf., Albuquerque, N. Mex., 1-3 Jun. 1981
(Contract W-7405-eng-36)
(LA-UR-81-1601; CONF-810659-5) Avail: NTIS HC A02/MF A01

Characteristics are presented for two different types of explosive driven flux compression generators and a megavolt pulse transformer. Status reports are given for rail gun and plasma focus programs for which the generators serve as power sources. DOE

N82-10336# Montana State Univ., Bozeman. Dept. of Physics.
ELECTRICAL PROPERTIES OF LANTHANUM CHROMITE BASED CERAMICS IN HYDROGEN AND OXIDIZING ATMOSPHERES AT HIGH TEMPERATURES Final Report, 1 Apr. 1979 - 31 Mar. 1980
V. H. Schmidt Jun. 1981 63 p refs
(Contract DE-AS05-79ET-15415)
(DE81-028306; DOE/ET-15415/1) Avail: NTIS HC A04/MF A01

Several results regarding the effect of hydrogen on lanthanum chromite were determined. Thermally-activated diffusion of hydrogen through La(Mg)CrO3 was found with a high activation energy. It was found that its electrical conductivity drops drastically, especially at low temperature, after exposure to hydrogen at high temperature. Also, the curvature of most of the conductivity plots, as well as the inability to observe the Hall effect, lends support to the proposal by Karim and Aldred that the small-polaron model which predicts thermally activated mobility is applicable to doped lanthanum chromite. From differential thermal analysis, an apparent absorption of hydrogen near 3000 C was noticed. Upon cooling the lanthanum chromite in hydrogen and subsequently reheating it in air, desorption occurred near 1700 C. The immediate purpose of this study was to determine whether hydrogen has a deleterious effect on lanthanum chromite in solid oxide fuel cells. DOE

N82-10337# Research Inst. of National Defence Linkoeping (Sweden). Huvudavdelning 3.
MICROWAVE TUBES. REVIEW OF THE LITERATURE. NUMBER 1: AUGUST 1978 TO DECEMBER 1979 [MIKROVAAGSROER. LITTERATUROEVERSIKT NR 1. OMFATTANDE PERIODEN AUGUSTI 1978 - DECEMBER 1979]
Herbert Steyskal Oct. 1980 102 p refs In SWEDISH
(FOA-C-30200-E) Avail: NTIS HC A06/MF A01

Development trends are analyzed. Greatest activity with regard to conventional microwave tubes is noted for travelling wave

tube technology. Importance is attached to generating and amplification methods which promise good results. Frequencies up to the infrared are reported. With the exception of the gyrotron, these projects are in the research stage. Author (ESA)

N82-10338# AEG-Telefunken, Heilbronn (West Germany). Geschaeftsbereich Halbleiter.

DEVELOPMENT OF A TECHNIQUE FOR THE AUTOMATIC WIRELESS MOUNTING OF INTEGRATED CIRCUITS Final Report

Alfons Schmitt Bonn Bundesministerium fuer Forschung und Technologie Oct. 1980 63 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-T-80-085; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 13,30

This technique is also applicable to power circuits because the heat can be easily removed. It is suitable either for highly reliable circuits or for devices for consumer applications. It is an economical technique, able to compete with cheap labor countries. Author (ESA)

N82-10339# AEG-Telefunken, Heilbronn (West Germany). Geschaeftsbereich Halbleiter.

LARGE SCALE PRODUCTION METHODS FOR OPTOELECTRONIC COMPONENTS Final Report

Werner Schoebol Bonn Bundesministerium fuer Forschung und Technologie Nov. 1980 80 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-T-80-088; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 16,80

Light parameters were measured at the wafer probe station for light emitting diode (LED) wafers, infrared diode-wafers and photodetector wafers. The dicing of 3-5 wafers by: (1) diamond scribing and breaking; (2) laser scribing and breaking; and (3) sawing of wafers were compared. The encapsulation of optoelectronic components by injection molding with polycarbonates (development of injection molding tools for production), and the development of measurement techniques for final testing of optoelectronic components are discussed. A scheme for the automatic final measurement of LED's with the possibility of separating them into groups with different luminous intensities and spectral distribution, is presented as well as the development of a testing method for seven segment numerical displays). Author (ESA)

N82-10340# Stuttgart Univ. (West Germany). Inst. fuer Netzwerk und Systemtheorie.

HYBRIDE MICROCIRCUITS IN TANTALUM THIN-FILM TECHNOLOGY Final Report

Ernst Lueder, Traugott Kallfass, Holm Baeger, Bernd Kaiser, Juergen Mutschler, Hans W. Renz, Reinhard Riekeles, and Hans-Juergen Tilch Bonn Bundesministerium fuer Forschung und Technologie Nov. 1980 228 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-T-80-120; ISSN-0340-7608) Avail: NTIS HC A10/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 39,30

The design and manufacture of linear circuits, especially RC active filters in tantalum thin film technology are presented. The R and C components are made from a single sputtered film out of Ta oxinitride, with a temperature compensated time constant RC. An economical manufacturing process requires only one high vacuum step. Building blocks and tuning algorithms for filters with a low (<20) and a high (>120) pole-Q are described. Circuits with RC thin film lines require a small substrate area. Examples of circuits are pulse code modulation low passes and a telephone touchtone system. Author (ESA)

N82-10341# Valvo G.m.b.H., Hamburg (West Germany). Roehren und Halbleiterwerke.

APPLICATION OF ION IMPLANTATION IN THE MANUFACTURING OF MONOLITHIC BIPOLAR ANALOGUE INTEGRATED CIRCUITS Final Report

Wolfgang Dietsch, Andreas Gakis, Norbert Hofmann, Wolfgang Nolde, and Uwe Suckow Bonn Bundesministerium fuer Forschung und Technologie Dec. 1980 110 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-T-80-147; ISSN-0340-7608) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 23,10

The main items were: high frequency transistors; bases; resistors (especially those with a high resistance); passivation methods; and components. The existing doping methods were replaced by more controllable ion implantation and processes are developed which can only be realized by means of ion implantation. In both cases, processes were developed with technological as well as economical advantages with respect to standard technologies. The results are partly introduced into large-scale production. Author (ESA)

N82-10342# Research Inst. of National Defence, Linkoeping (Sweden). Huvudavdelning 3.

METHODS OF GENERATION AND AMPLIFICATION OF MICRO- AND MILLIMETER WAVES IN VACUUM TUBES

Herbert Steyskal Jan. 1981 104 p refs In SWEDISH; ENGLISH summary

(FOA-C-30210-E) Avail: NTIS HC A06/MF A01

The principles underlying electron tubes, such as gyrotrons, peniotrons, free electron lasers, orotrons, and gyrocons are described. These generators for very high frequency and very high power generators are considerably different from conventional microwave tubes. They are at present in the research and development stage but may soon become important for fusion and radar technology. Author (ESA)

N82-10343# British Gas Corp., Newcastle-upon-Tyne (England). Engineering Research Station.

MICROELECTRONICS SERVING ENGINEERING

T. M. Sporton and W. L. Mercer Nov. 1980 29 p refs Presented at 46th Inst. of Gas Eng. Autumn Meeting, London, Nov. 1980

(ERS-E-273) Avail: NTIS HC A03/MF A01

The development of electronics technology over the past 20 years was reviewed. Microelectronics is shown to be the product of a long evolution rather than a revolution. The mode of operation of digital electronic circuits, from simple units to the microcomputer, is described. Potential applications of these techniques within the gas industry are explored. The need for gas engineers to become familiar with the capabilities of microelectronics, and to take the initiative in defining worthwhile applications within their own areas of expertise, is noted. Predictions of future developments are made. Author (ESA)

N82-10344# Filtronic Components Ltd., Leeds (England).

MICROWAVE DEVICES WITH ASYMMETRIC FREQUENCY CHARACTERISTICS AND CASCADE DECOMPOSITION STUDY Final Report

J. D. Rhodes Paris ESA 1981 60 p

(Contract ESTEC-3968/79/NL-DG(SG))

(ESA-CR(P)-1439) Avail: NTIS HC A04/MF A01

A compact diplexer that produces an overall asymmetric or symmetric response was built and tested. A grounded strip was placed between resonators to overcome the problem of undesirable length due to the low internal values of coupling capacitance. The theory bemind this configuration is presented with the theory for the coupling between two rods separated by a grounded rod, as used in the design. Channels are of 43 MHz bandwidth to meet loss requirements and sixth degree to meet selectivity requirements. Measured performance meets all out of band attenuation criteria, but because of the unplated structure in-band loss is high under 1dB. Author (ESA)

N82-10345# National Bureau of Standards, Washington, D.C. Electrosystems Div.

OPTICAL MEASUREMENTS FOR INTERFACIAL CONDUCTION AND BREAKDOWN (1980) Annual Report

R. E. Hebner, E. F. Kelley, J. E. Thompson (South Carolina Univ.), T. S. Sudarshan (South Carolina Univ.), and T. B. Jones (Colorado State Univ.) May 1981 90 p refs Sponsored in part by DOE, Washington, D.C.

(PB81-216343; NBSIR-81-2275) Avail: NTIS HC A05/MF A01 CSCL 09A

Techniques were developed to measure the fields in transformer oil using Kerr effect and to measure the surface charge at a gas-solid interface using the Pockels effects. Measurements are supplemented by calculations of the distortion produced by selected interfacial charge distributions. The relatively pure transformer oil used showed little space charge distortion of the electric field. There also was no statistically significant preference for breakdown in the vicinity of the interface. At vacuum-solid interfaces, however, interfacial breakdown was observed and surface charging was measured. As gas is introduced into the system, the surface charge is removed so that no effect of surface charging was detected at atmospheric pressure. At pressures above atmospheric, there is evidence that surface charging may again become important. GRA

N82-10346# National Bureau of Standards, Washington, D.C. Electrosystems Div.

DEVELOPMENT OF POWER SYSTEM MEASUREMENTS Quarterly Report, 1 Jan. - 31 Mar. 1981

R. E. Hebner Apr. 1981 20 p refs Prepared for DOE, Washington, D.C.

(PB81-220261; NBSIR-81-2283) Avail: NTIS HC A02/MF A01 CSCL 09A

The errors associated with measurements of the vertical current density in an electrical environmental consisting of a dc field with space charge are considered. The measurement of RF attenuation in distribution cables, the onset characteristics of positive and negative corona in compressed SF6 gas, and the measurement of the space charge density in transformer oil subjected to 60-Hz excitation are also examined. GRA

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics*.

N82-10347 Polytechnic Inst. of New York, Brooklyn.

A THEORETICAL AND EXPERIMENTAL INVESTIGATION OF THE HYPERSONIC VISCOUS SHOCK LAYER FOR LARGE RATES OF INJECTION Ph.D. Thesis

Peter Plostins 1981 151 p

Avail: Univ. Microfilms Order No. 8118891

The conservation form, axisymmetric, full shock layer equations are solved in the stagnation region for large rates of air injection. The transverse momentum and continuity equations are solved by an unconditionally stable, coupled, block tri-diagonal algorithm. The energy equation is integrated uncoupled from the rest of the system. A variable grid is prescribed in order to insure that high resolution is obtained in the vicinity of the injection interface. Solutions are obtained for a wide range of Mach numbers and Reynolds numbers. A numerical method is proposed to solve the conservation form of the full shock layer equations on a slender sphere cone for small angles of incidence. An experimental study of thin film cooling conducted on a 10 deg half angle sphere cone at angle of attack is described. Dissert. Abstr.

N82-10348 Pennsylvania Univ., Philadelphia.

EFFECTS OF NON-UNIFORM HEATING AND INTERNAL BAFFLES ON NATURAL CONVECTION IN INCLINED RECTANGULAR ENCLOSURES Ph.D. Thesis

Paul Kuo-Bing Chao 1981 376 p

Avail: Univ. Microfilms Order No. 8117767

Finite difference calculations for providing three dimensional solutions for natural convection in a 2 x 1 x 1 inclined rectangular closure are presented. Two forms of non-uniform heating were investigated. In the first form of nonuniform heating, sawtooth temperature distributions with different amplitudes orientations were imposed on the lower (2 x 1) surface to simulate the effect of a cooling coil or water jacket on the collector plate of a flat solar heater. In the second form of non-uniform heating, a uniform temperature was imposed on one 1 x 1 segment of the lower surface while the other 1 x 1 segment and the four side walls were insulated. A lower uniform temperature was imposed on the upper surface. The effect of inclining both the long and short dimensions was investigated. The effect of thin baffles of various sizes, locations and conductivities was investigated theoretically and experimentally for a rectangular enclosure with a uniform higher temperature on the lower surface and a uniform lower temperature upper surface. Dissert. Abstr.

N82-10349 Notre Dame Univ., Ind.

DIFFUSE MASS TRANSPORT IN A POROUS MEDIUM Ph.D. Thesis

Fun Gau Ho 1981 144 p

Avail: Univ. Microfilms Order No. 8118571

Variational methods are used to investigate the problems of diffusive mass transport in a porous medium. Calculations of the effective diffusivities are performed for a model pore structure generated by randomly placed, freely overlapping solid spheres all of the same radius. Effects of the tortuosity of the diffusion paths are considered. Numerical evaluations are used to test some approximate engineering models. For gaseous transition region diffusion the mean free path kinetic theory is used to derive a variational upper bound on the effective transition region diffusivity. For the simultaneous liquid or gas phase Fickian bulk diffusion in the void and Fickian surface diffusion on the pore wall surface, an analytical expression for effective diffusion coefficient is obtained and compared with the usual engineering model of parallel surface and void diffusion. The simultaneous gaseous transition region diffusion in the void and the Fickian surface diffusion on the pore wall surface are examined numerically. Dissert. Abstr.

N82-10350 Carnegie-Mellon Univ., Pittsburgh, Pa.

DYNAMIC SIMULATION WITH AN EQUATION BASED FLOWSHEETING SYSTEM Ph.D. Thesis

Selahattin Kuru 1981 232 p

Avail: Univ. Microfilms Order No. 8118439

The ASCENT-II dynamic simulation system is described. Differential equations, integral equations and retarded equations are treated by universal mathematical units which can be used to form the unit modules. The equation solving method employed permits the degrees of freedom in a flowsheet to be changed almost arbitrarily, allowing simulation and design to be done simultaneously. Decision variables specified as trajectories are handled cleanly and neatly. The tear variable concepts is introduced in order to reduce computation time in the numerical integration of differential-algebraic systems. A method is developed to treat the integration step-size as a variable to be calculated such that the integration error criteria is automatically satisfied at each step of numerical integration. The spline collocation method is studied within the context of flowsheeting and is found to be a suitable global approximation method. Dissert. Abstr.

N82-10351 Notre Dame Univ., Ind.

ANALYTICAL INVESTIGATION OF HEAT TRANSFER OF TURBULENT FLOW IN PIPES NEAR THE THERMODYNAMIC CRITICAL POINT Ph.D. Thesis

Marco Antonio Egoavil 1981 212 p

Avail: Univ. Microfilms Order No. 8118566

An analytical investigation is carried out near supercritical turbulent forced convection in pipes. A unified theoretical model together with available experimental data, to identify and determine the physical mechanisms involved in the heat transfer deterioration anomaly of the near supercritical phenomena. A finite difference scheme is used to solve the boundary layer-parabolic type of hydrodynamic and energy equations. A rate equation for determining the turbulent viscosity is added to the governing equations, which takes into account the effects of turbulence convection, turbulence diffusion, and turbulence generation and decay due to mean shear, small eddy dissipation, buoyancy, and pressure straining. Logarithmic-law equations for the wall region of the pipe are utilized as the forcing function of boundary conditions for the mean and turbulent field calculations. The theory procedures, and computer program are successfully tested in several limiting cases such as the thermal laminar flow in the entrance region in a tube, the turbulent

flow in the entrance region in a pipe, and in fully developed turbulent flow with heat transfer in tubes. Dissert. Abstr.

N82-10352 Illinois Inst. of Tech., Chicago.
ALGORITHMIC ASPECT OF THE SOLUTION OF TRANSIENT HEAT TRANSFER IN STRUCTURES Ph.D. Thesis
Mohammad Hassan Kadivar 1980 147 p
Avail: Univ. Microfilms Order No. 8112421

The analysis and design of high speed reentry vehicles requires the solution of the transient heat transfer equations in the structure. The application of the finite element method to such a problem results in a system of stiff ordinary differential equations. Variable step, of such systems of explicit algorithms for the solution of such systems of differential equations are investigated. An efficient solution algorithm with an efficient storage strategy for the ill-conditioned large set of algebraic equations which arises from the use of implicit algorithms applied to the system of differential equations is developed. The performance of the algorithm is compared to other algorithms for the solution of two and three dimensional transient heat transfer problems in structures. Dissert. Abstr.

N82-10353 Pennsylvania Univ., Philadelphia.
HEAT TRANSFER AND FLOW DISTRIBUTION WITHIN RADIANT-CONVECTIVE FINNED-TUBE MANIFOLD ASSEMBLIES Ph.D. Thesis
Gerard Francis Jones 1981 375 p
Avail: Univ. Microfilms Order No. 8117797

A theoretical investigation of heat transfer and the distribution of flow within an inclined finned-tube manifold assembly having radiative and convective boundary conditions is presented. Nonuniform flow distribution among the riser tubes and flow development and buoyancy effects within them, as well as other phenomena which are normally neglected in state of the art models (such as the Hottel-Whillier-Bliss model) are included in the analysis. A mathematical method for solving a class of conjugated heat transfer problems which include the finned-tube manifold assembly is developed. The finned-tube manifold assembly problem is divided into three subproblems: (1) riser tube fluid dynamics and heat transfer, (2) radiant convective finned-tube heat transfer, (3) dual-manifold system hydrodynamics. Both integrated and local results are presented. These are obtained for upper and lower thermal performance bounding cases, for both parallel and reverse flow. The effects due to simultaneous flow development and buoyancy within the riser tube flows are analyzed. Dissert. Abstr.

N82-10354 Case Western Reserve Univ., Cleveland, Ohio.
DILUTION JETS IN ACCELERATED CROSS FLOWS Ph.D. Thesis
Abraham Lipshitz 1981 161 p
Avail: Univ. Microfilms Order No. 8118627

Results of flow visualization experiments and measurements of the temperature field produced by a single jet and a row of dilution jets issued into a reverse flow combustor are presented. The flow visualization experiments were designed to examine the separate effects of longitudinal and transverse acceleration on the jet trajectory and spreading rate. A model describing a dense single jet in a lighter accelerating cross flow is developed. The model is based on integral conservation equations, including the pressure terms appropriate to accelerating flows. It uses a modified entrainment correlation obtained from previous experiments of a jet in a cross stream. Comparison between combustor experimental results and model calculations shows poor agreement due to the drifting effect which is not taken into consideration in the model calculations. Results are shown in the form of consecutive normalized temperature profiles. The confinement parameters appears to become increasingly important with decreasing spacing ratio, in particular when its effect is enhanced by the drifting phenomena and associated pressure field. Dissert. Abstr.

N82-10355 Notre Dame Univ., Ind.
FINITE DIFFERENCE ANALYSIS OF RADIATION CONVECTION INTERACTIONS IN TWO-DIMENSIONAL ENCLOSURES Ph.D. Thesis
Lien-Chang Chang 1981 317 p
Avail: Univ. Microfilms Order No. 8118561

The gas radiation-surface radiation-natural convection interaction in a two dimensional partitioned enclosure in the laminar flow regime was investigated. An upward finite difference scheme was used to solve the governing equations for a fully compressible buoyancy driven flow. Temperature, velocity components, pressure and density at steady state were obtained from numerical solutions. The average total Nusselt number was derived from the convective and radiative heat fluxes at the side walls. Dissert. Abstr.

N82-10356# Toronto Univ., Downsview (Ontario). Inst. for Aerospace Studies.
PSEUDO-STATIONARY OBLIQUE SHOCK-WAVE REFLECTION IN CARBON DIOXIDE: DOMAINS AND BOUNDARIES
Samon Ando Apr. 1981 131 p refs Sponsored in part by the Natural Science and Engineering Research Council of Canada and the ARO
(Grant AF-AFOSR-3303-77)
(UTIAS-TN-231; ISSN-0082-5263) Avail: NTIS HC A07/MF A01

The transition boundaries for a triatomic gas between various types of shock-wave reflection configurations exhibited by a plane shock impinging on a compressive corner in a shock tube were studied experimentally using CO2 as the test gas. The shock Mach numbers ranged from 1.8 to 10.2, and the initial pressure from 3.5 to 80 torr at room temperature. The regions corresponding to the four types of reflection were obtained in terms of the shock Mach number M sub s and the wedge angle theta sub w. The resultant transition map in the M sub s minus theta sub w plane is presented. The transition boundaries are determined. The density contours of the flow fields were obtained by means of infinite-fringe interferograms. Shock-polar diagrams are analyzed. It is concluded that a perfect-gas model with an appropriate constant gamma should be used in determining the transition angles between various types of shock reflection for shock Mach numbers at least up to 10. J.D.H.

N82-10357# Toronto Univ., Downsview (Ontario). Inst. of Aerospace Studies.
AN EXPERIMENTAL INVESTIGATION OF RISE TIMES OF VERY WEAK SHOCK WAVES
Ole Holst-Jensen Mar. 1981 86 p refs Sponsored in part by the Canadian Ministry of Transport
(Grant AF-AFOSR-3303-77)
(UTIAS-TN-229; CN-ISSN-0082-5263) Avail: NTIS HC A05/MF A01

The technique of using exploding wires to generate N waves is developed and described. The discrepancy between the shock rise times predicted by the weak shock theory and the 100 to 1000 times greater rise times measured for sonic booms is investigated. Consideration is given to N waves generated by sparks in the UTIAS Traveling Wave Sonic Boom Simulator, and from supersonic aircraft. The experimental equipment is described. J.D.H.

N82-10358*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
COOLING BY CONVERSION OF PARA TO ORTHO-HYDROGEN Patent Application
Allan Sherman, inventor (to NASA) Filed 10 Sep. 1981 14 p (NASA-Case-GSC-12770-1; US-Patent-Appl-SN-301075) Avail: NTIS HC A02/MF A01 CSCL 20D

The cooling capacity of a solid hydrogen cooling system is significantly increased by exposing vapor created during evaporation of a solid hydrogen mass to a catalyst and thereby accelerating the endothermic para-to-ortho transition of the vapor to equilibrium hydrogen. Catalysts such as nickel, copper, iron or metal hydride gels of films of nickel, copper or iron or hydride gels of nickel, copper or iron in a low pressure drop catalytic reactor are suitable for accelerating the endothermic para-to-ortho conversion. NASA

N82-10359*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
GAS LEVITATOR AND METHOD FOR CONTAINERLESS PROCESSING Patent Application
Leroy H. Berge, William A. Oran, and John M. Theiss, inventors (to NASA) Filed 28 Aug. 1981 17 p

(NASA-Case-MFS-25509-1; US-Patent-Appl-SN-297486) Avail: NTIS HC A02/MF A01 CSCL 20D

An elongated levitation tube having a contoured interior in the form of a convergent section, and a constriction and divergent section, wherein the levitation node is created, is described. Gas flow control means control flow to prevent separation of flow from the interior walls in the region of specimen. An apparatus provides for levitating and heating the specimen simultaneously by combustion of a suitable gas mixture combined with an inert gas. T.M.

N82-10360*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

IMPROVED CONSTANT-OUTPUT ATOMIZER Patent Application

Jack Y. Dea, inventor (to NASA) (Desert Research Inst.) Filed 2 Oct. 1981 12 p Sponsored by NASA

(NASA-Case-MFS-25631-1; US-Patent-Appl-SN-308203) Avail: NTIS HC A02/MF A01 CSCL 20D

A constant-output atomizer is described which includes a generally frustoconical expansion nozzle for producing an air jet. A liquid feed line supplies liquid to be atomized by the air jet, and the body includes a groove which opens into the diffuser section of the nozzle downstream of the throat for conducting liquid from the feed line to the nozzle. The groove extends in a direction perpendicular radially to the axis of the nozzle, and it has a depth approximately equal to half the axial length of the nozzle. Liquid, conducted by capillary action in the groove to the nozzle, is atomized into a fine mist by the air jet in the nozzle; and the groove eliminates fluctuations in spray order. NASA

N82-10361*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

A COMPILATION OF UNSTEADY TURBULENT BOUNDARY-LAYER EXPERIMENTAL DATA

Lawrence W. Carr Sep. 1981 55 p refs Prepared in cooperation with Army Aviation Research and Development Command, St. Louis

(NASA-TM-81317; A-8581; USAVRADCOM-TR-81-A-26) Avail: NTIS HC A04/MF A01 CSCL 20D

An extensive literature search was conducted and those experiments related to unsteady boundary layer behavior were cataloged. In addition, an international survey of industrial, university, and governmental research laboratories was made in which new and ongoing experimental programs associated with unsteady turbulent boundary layer research were identified. Pertinent references were reviewed and classified based on the technical emphasis of the various experiments. Experiments that include instantaneous or ensemble averaged profiles of boundary layer variables are stressed. The experimental apparatus and flow conditions are described and summaries of acquired data and significant conclusions are summarized. Measurements obtained from the experiments which exist in digital form were stored on magnetic tape. Instructions are given for accessing these data sets for further analysis. Author

N82-10362*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

A DOCUMENTATION OF A THREE-DIMENSIONAL SHOCK SEPARATED TURBULENT BOUNDARY LAYER

M. I. Kussoy and C. C. Horstman Sep. 1981 119 p refs

(NASA-TM-81327; A-8713) Avail NTIS HC A06/MF A01 CSCL 20D

A detailed investigation of a flow in which a three dimensional shock wave separates a two dimensional turbulent boundary layer is presented. The resulting flow field is highly three dimensional with a significant portion of flow separation on the surface at the phi = 0 deg (windward) plane as well as a large zone of secondary surface flow off this plane. Tests were performed at a nominal Mach number of 2.3 for a range of Re/m of 11.7 x 1 million 105.8 x 1 million. At the lower Reynolds number, mean and fluctuating experimental measurements, including yaw angles, static pressure, turbulent shear stress, and turbulent kinetic energy, were obtained throughout the entire flow field. Pressures, flow angles, and shear stress were measured on the surface for all Reynolds numbers. These data which define the complete flow field, including the upstream undisturbed flow region, are presented in graphical and tabular form. Author

N82-10363# Wisconsin Univ. - Madison. Mathematics Research Center.

THE KORTEWEG-de VRIES EQUATION, POSED IN A QUARTER PLANE Technical Summary Report

Jerry Bona (Chicago Univ.) and Ragnar Winther Aug. 1981 84 p refs

(Contract DAAG29-80-C-0041; Grant NSF MCS-80-02327)

(AD-A103861; MRC-TSR-2258) Avail: NTIS HC A05/MF A01 CSCL 12/1

An initial and boundary value problem for the Korteweg-de-Vries equation is shown to be well posed. The considered problem may serve as a model for unidirectional propagation of plane waves generated by a wavemaker in a uniform medium. Such models apply in regimes in which nonlinear and dispersive effects are of comparable small order. Author (GRA)

N82-10364# Wisconsin Univ. - Madison. Mathematics Research Center.

THE INITIAL BOUNDARY VALUE PROBLEM FOR THE EQUATIONS OF MOTION OF COMPRESSIBLE VISCOUS AND HEAT-CONDUCTIVE FLUID Technical Summary Report

Akitaka Matsummura (Kyoto Univ.) and Takaaki Nitshida (Kyoto Univ.) Jul. 1981 27 p refs

(Contract DAAG29-80-C-0041; Grant NSF MCS-79-27062)

(AD-A103866; MRC-TSR-2237) Avail: NTIS HC A03/MF A01 CSCL 20/4

We prove the global existence and uniqueness of solutions to the equations of motion for compressible, viscous and heat-conductive Newtonian fluid in a bounded domain, with small initial data and external force, and boundary conditions of zero velocity and constant temperature. We also show that the solution decays exponentially to a unique equilibrium state. The proof uses an energy method similar to the one used in our previous results on the pure initial value problem plus some new techniques for estimates near the boundary. Author (GRA)

N82-10365# Maine Univ., Orono.

PERTURBATION THEORY FOR POLAR FLUIDS Final Report

Jayendran C. Rasaiah Jul. 1981 29 p refs

(Contract N00014-78-C-0724)

(AD-A103963) Avail: NTIS HC A03/MF A01 CSCL 20/10

Work completed under this grant on polar fluids includes an extension of perturbation theory to polar molecules with point octopoles and hexadecapoles as well as a preliminary investigation of molecules with non-spherical cores. In addition, the ordering of dipolar molecules near a flat electrified wall has been investigated in the linearized hypernetted chain (LHNC) and quadratic hypernetted chain (QHNC) approximations. This has led to a new study of electrostriction and non-linear effects in the polarization density of dipolar fluids. Author (GRA)

N82-10366# Brown Univ., Providence, R. I. Div. of Engineering.

FLOW IN GEOTHERMAL WELLS. PART 4: TRANSITION CRITERIA FOR TWO-PHASE FLOW PATTERNS

Z. Bilicki and J. Kestin Dec. 1980 22 p refs

(Contract DE-AC02-79ET-27225)

(DE81-028312; DOE/ET-27225/9) Avail: NTIS HC A02/MF A01

Detailed considerations justifying the criteria for transitions between flow patterns are presented. The following are covered: transition from bubble to plug (or slug) flow, transition from plug flow to froth flow, transition from froth to annular mist flow, and model comparisons. DOE

N82-10367# Bettis Atomic Power Lab., West Mifflin, Pa.

COMPARISONS OF TURBULENT-FLOW CALCULATIONS WITH EXPERIMENT

M. Goldsmith, ed. Aug. 1981 110 p

(Contract DE-AC11-76PN-00014)

(DE81-031930; WAPD-TM-1473) Avail: NTIS HC A06/MF A01

Predictions of the (k, epsilon) turbulence model are compared with experiment for a number of standard cases: fully developed flows in ducts and pipes, developing pipe flow, flows through axisymmetric and rectangular sudden expansions, flows over steps,

and axisymmetric swirling flows. In a general way, it appears that the (k, epsilon) model gives good predictions of velocity profiles and good enough estimates of pressure drops to be useful for many engineering applications. Estimates of turbulence intensities and stresses are much less reliable and range from excellent for fully developed flows to unsatisfactory for strongly swirling flows. DOE

N82-10368# Allied Chemical Corp., Morristown, N.J.
ORGANIC ABSORPTION GAS-FIRED RESIDENTIAL HEAT PUMP
Kevin P. Murphy 1981 5 p Presented at the DOE Heat Pump Contractor's Program Integration Meeting, McLean. Va., 2-4 Jun. 1981 Prepared for ORNL
(Contract W-7405-eng-26)
(DE81-024131; CONF-810672-19) Avail: NTIS HC A02/MF A01

The development program of a system utilizing a new absorption pair, R133a (CF3CH2Cl) as the refrigerant, and ETFE (ethyletra-hydrofurfury lether) as the absorber fluid, is described. A diagram of the basic configuration is shown. The cooling mode and the heating mode are discussed. Six units of an early hardware design were constructed and tested. Two of these units were placed in home heating service during the 1980-81 season. A market evaluation of the business potential of the absorption system was made, identifying location and size of the likely market for such a system. A performance simulation analysis was performed for seven cities in the US. From these, general characteristics of the areas having the greatest performance benefits were established. DOE

N82-10369# Los Alamos Scientific Lab., N. Mex.
HEAT-PIPE DEVELOPMENT FOR THE SPAR SPACE-POWER SYSTEM
W. A. Ranken 1981 15 p refs Presented at the 4th Intern. Heat Pipe Conf., London, 7-9 Sep. 1981
(Contract W-7405-eng-36)
(LA-UR-81-1025; CONF-810902-2) Avail: NTIS HC A02/MF A01

The use of alkali metal heat pipes to provide redundant, reliable, and low loss heat transfer at high temperatures is described. Three sets of heat pipes are used in the system. These include sodium/molybdenum heat pipes to transfer heat from the reactor core to the conversion system, potassium/niobium heat pipes to couple the conversion system to the radiator in a redundant manner, and potassium/titanium heat pipes to distribute rejected heat throughout the adiator surface. The designs of these units are discussed and fabrication methods and testing results are described. DOE

N82-10370# Oak Ridge National Lab., Tenn. Energy Div.
ANALYTICAL MODEL OF THE ROUND BUOYANT JET
D. W. Lee 1981 29 p refs Presented at the Symp. on Fluid Mech. of Combustion Systems, Boulder, Colo., 22 Jun. 1981
(Contract W-7405-eng-26)
(DE81-023940; CONF-810621-5) Avail: NTIS HC A03/MF A01

An analytical model for a round turbulent buoyant jet which is discharged vertically into a stagnant ambient is presented. The buoyant jet is considered to have three separate zone models which are matched to form a complete solution. The velocity field is determined for the entire jet and plume regions by the use of an eddy viscosity which varies along the axis of the jet. The centerline decay of buoyancy is determined throughout and the results are compared to existing numerical codes. The model is applied to the disposal of carbon dioxide enriched seawater. The results can be used to provide design information for minimizing or maximizing the dilution of a discharge by the receiving environment. DOE

N82-10371# Sandia Labs., Albuquerque, N. Mex.
SHOCK COMPRESSION TEMPERATURE RISE DETERMINED FROM RESISTIVITY OF EMBEDDED METAL FOILS
D. D. Bloomquist and S. A. Sheffield 1980 10 p refs Presented at the APS Conf. on Shock Waves in Condensed Matter, Menlo Park, Calif., 23 Jun. 1981
(Contract DE-AC04-76DP-00789)
(DE81-024083; SAND-80-2836C; CONF-810684-11) Avail: NTIS HC A02/MF A01

The temperature rise of polymethyl methacrylate (PMMA) was determined from measurements of the electrical resistivity of embedded copper foils. The temperature of the copper was determined from the observed foil resistance and known values of the change in copper resistivity with temperature and shock compression. Temperature values obtained over a stress range from 0.9 to 6.0 GPa are in good agreement with thermocouple measurements reported previously. DOE

N82-10372# Argonne National Lab., Ill.
STUDY OF TURBULENT NATURAL-CIRCULATION FLOW AND LOW-PRANDTL-NUMBER FORCED-CONVECTION FLOW
K. S. Chung and D. H. Thompson 1980 9 p refs Presented at the Natl. Heat Transfer Conf., Orlando, Fla., 29-30 Jul. 1980
(Contract W-31-109-eng-38)
(DE81-023531; CONF-800723-27) Avail: NTIS HC A02/MF A01

Calculation methods and results are discussed for the coupled energy and momentum equations of turbulent natural circulation flow and low Prandtl number forced convection flow in an effort to study of the thermal hydraulic behavior of coolant flowing in a liquid metal fast breeder reactor channel under natural circulation conditions. The two equation turbulence model is used to evaluate the turbulent momentum transport property. Because the analogy between momentum transfer and heat transfer does not generally hold for low Prandtl number fluid and natural circulation flow conditions, the turbulent thermal conductivity is calculated independently using equations similar to the two-equation turbulence model. The numerical technique used in the calculation is the finite element method. DOE

N82-10373# Argonne National Lab., Ill.
CALCULATIONAL METHOD FOR COMBINED NATURAL CIRCULATION AND FORCED-CONVECTION FLOW IN A CHANNEL
K. S. Chung and D. H. Thompson 1980 8 p refs Presented at the 19th Natl. Heat Transfer Conf., Orlando, Fla., 27-30 Jul. 1980
(Contract W-31-109-eng-38)
(DE81-023542; CONF-800723-26) Avail: NTIS HC A02/MF A01

A finite element solution is presented for combined natural circulation and forced convection flow in a channel. Because the buoyancy force plays an important role in a mixed convection flow, an iteraction scheme was used in solving the coupled energy momentum equations. The momentum equations and the pressure equation are solved to calculate velocity profiles instead of solving the momentum equations with the continuity equation. Though the pressure equation is obtained by using the continuity equation, the continuity principle is reinforced into the momentum equations and the pressure equation at each iteraction. Calculations are performed for the combined natural circulation and forced convection case and the forced convection only case. DOE

N82-10374# Technische Physische Dienst TNO-TH, Delft (Netherlands).
BOUNDARY LAYER MEASUREMENTS ON A SHIP MODEL USING A LASER DOPPLER VELOCIMETER [GRENSLAAGMETINGEN AAN EEN SCHEEPSMODEL MET BEHULP VAN EEN LASER DOPPLER SNELHEIDSMETER]
A. H. vanKrieken and J. Oldengarm 18 Oct. 1979 15 p refs (RVO-TNO-A76/KM/016; TDCK-73106; TD-905.108) Avail: NTIS HC A02/MF A01

Boundary layer velocity profiles were measured on a moving ship model in a water tank, using a backscatter laser Doppler velocimeter system (LDS). The LDS has previously given good results when applied to a stationary uniform flow field. Its applicability when measuring the flow around a moving model is assessed. In particular, the performance of the LDS frequency evaluator and photon correlator are considered. Measurement results are shown and compared with theoretical calculations of boundary layer flow past a randomly oriented ship model.
Author (ESA)

N82-10375# Technical Research Centre of Finland, Espoo. Lab. of Heating and Ventilating.
THERMAL CONDUCTANCE OF WALL STRUCTURES
Seppo Ahvenainen, Erkki Kokko, and Antero Aittomaeki Dec. 1980 72 p refs
(VTT-54; ISBN-951-38-1120-4; ISSN-0357-7031) Avail: NTIS HC A04/MF A01

Five test walls of differing structural properties or direction, but all parts of existing buildings, were subjected to measurements during winter, spring, and summer. The measured time dependent values of the inside surface temperature, and the heat flux through the inside surface, were analyzed by computer, according to a theoretical model. Compatibility of results was poor. Only the nearly steady state periods in sandwich type test walls gave adequate results, nonsteady state behavior being different from that expected in an ideal multilayer wall.
Author (ESA)

N82-10376# Technical Research Centre of Finland, Espoo. Metals Lab.
TUBE TESTING BY INSIDE EDDY-CURRENT PROBE [PUTKIEN TARKASTUS SISAEPUOLISELLA PYOERREVIRTAKALLA]
Matti Sarkimo 1981 15 p refs In FINNISH; ENGLISH summary
(VTT-81; ISBN-951-38-1153-0; ISSN-0355-6395) Avail: NTIS HC A02/MF A01

The principles of eddy current testing, methods and equipment are reviewed. Use of the inside eddy current probe for detecting corrosion and erosion defects inside heat exchanger tubes is described. The defective areas are easy to locate in the longitudinal direction of the tubes. By indication analysis, defects inside and outside the tubes can usually be separated and also the defect depths can be estimated with sufficient accuracy. Results of typical inspections are shown. Author (ESA)

N82-10377# Imperial Coll. of Science and Technology, London (England). Dept. of Mechanical Engineering.
EXPERIMENTAL AND THEORETICAL INVESTIGATION OF THREE DIMENSIONAL TURBULENT MIXING IN JETS AND DUCTS Ph.D. Thesis - London Univ.
George W. Carroll Nov. 1980 279 p refs
(HTS/80/6) Avail: NTIS HC A13/MF A01

Only parabolic flows are considered. The model was derived from a two dimensional model, based on a turbulent viscosity concept and the supposition that turbulence can be adequately described by the kinetic energy of turbulence and the dissipation rate of turbulent kinetic energy. Predictions are made for two laboratory model flows with complex-shaped shear layers. A computer program is developed that predicts the flow in an exhaust duct of a fan jet engine equipped with a lobe mixer. The important features of the flow are predicted accurately, even in the region where the shear layers completely fill the flow field where discrepancies are usually quite large. Author (ESA)

N82-10378# Imperial Coll. of Science and Technology, London (England). Dept. of Mechanical Engineering.
APPLICATIONS OF A LOW REYNOLDS NUMBER TURBULENCE MODEL AND WALL FUNCTIONS FOR STEADY AND UNSTEADY HEAT-TRANSFER COMPUTATIONS Ph.D. Thesis - London Univ.
Mohamed Abdel-Meguid Elhadidy Jan. 1980 243 p refs
(HTS/80/7) Avail: NTIS HC A11/MF A01

A composite model and a wall function method for computing turbulent flow and heat transfer close to walls are described. The Reynolds stress is calculated from the kinetic energy of turbulence and its dissipation rate, by means of differential transport equations. Semi-analytical solutions are employed and a solution applicable for the whole range of laminar Prandtl number fluids is developed, considering the variation of effective thermal laminar sublayer thickness with Reynolds and laminar Prandtl numbers. Applications to the computation of steady hydrodynamic, steady, and unsteady heat transfer in pipes are presented. Conjugate heat transfer analysis of the effects of streamwise diffusion of heat inside a solid wall and in the flow fields, and effects of solid to fluid conductivity ratio, are given. Comparison with experimental data shows good agreement. Data from investigations on an unsteady heat transfer conjugate problem support the validity of the composite model. Author (ESA)

N82-10379 California Inst. of Tech., Pasadena.
STUDIES OF THE NONLINEAR SCHROEDINGER EQUATION AND ITS APPLICATION TO WATER WAVES Ph.D. Thesis
David Uhl Martin 1981 135 p
Avail: Univ. Microfilms Order No. 8118919

Various properties of the nonlinear Schroedinger equation and special solutions thereof are investigated, with emphasis on applications to water waves. The spreading of model energy for initial conditions corresponding to unstable perturbations of a uniform wave is investigated numerically and analytically. Stability results for plane-wave envelopes on a two dimensional surface are calculated and verified numerically with the nonlinear Schroedinger equation. For standing wave disturbances, instability is found for both odd and even modes; as the period of the unperturbed solution increases, the instability associated with the odd modes remains, but that associated with the even modes disappears. Bifurcation techniques are used to obtain a new class of small amplitude water waves of permanent form. Two types of new solutions are found, one symmetric with respect to the carrier wave propagation direction, and one asymmetric. Finally, the nonliner Schroedinger equation is used to study the interaction of deep-water gravity waves with currents.
Dissert. Abstr.

N82-10985# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ANALYTICAL AND EXPERIMENTAL INVESTIGATION OF PERFORMANCE OF SUPERSONIC EJECTOR NOZZLE
Shen Huili and Chen Zhongqing *In its* Recent Selected Papers of NW Polytech. Univ., pt. 1 (FTD-ID(RS)T-0259-81-Pt-1) 20 Aug. 1981 p 87-109 refs Transl. into ENGLISH from Recent Selected Papers of NW Polytech. Univ., pt. 1 (Xian Shaanxi), 1979 (For primary document see N82-10980 01-99)
Avail: NTIS HC A17/MF A01

N82-11001# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
A STUDY ON INSULATED RISERS
Zhoe Yaohe, Zhang Yanwei, Qu Weitao, Lin Zaiue, Mao Zhiying, Wang Youxu, Niu Jingxin, and Zhang Qixn *In its* Recent Selected Papers of NW Polytech. Univ., pt. 2 (FTD-ID(RS)T-0260-81-Pt-2) 28 Aug. 1981 p 174-196 refs Transl. into ENGLISH from Recent Selected Papers of NW Polytech. Univ., pt. 2 (Xian Shaanxi), 1979 (For primary document see N82-10996 01-99)
Avail: NTIS HC A18/MF A01

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources*. For related information see also *06 Aircraft Instrumentation*, and *19 Spacecraft Instrumentation*.

N82-10380 Polytechnic Inst. of New York, Brooklyn.
INVESTIGATIONS OF ELECTRICALLY EXPLODING THIN SHELLED METALLIC TUBES Ph.D. Thesis
Charles David Hechtman 1981 104 p
Avail: Univ. Microfilms Order No. 8118873

An instability was identified experimentally on the tube prior to vaporization. A theoretical analysis was developed that predicts the instability. The metallic shells were exploded via a capacitor bank. The tube is observed with a modified shadowgraph technique and a long wavelength instability was observed to dominate at the onset. Theoretical treatment of the problem was derived in part from the Z pinch instability method of Kruskal and Tuck and the mechanical stress analysis was occupied mainly from the techniques of Onat on thin shelled tubes. These methods are integrated to form a theoretical basis for the instability analysis.

The experimental observation and the results of the theoretical analysis compare favorably. Dissert. Abstr.

N82-10381*# Princeton Univ., N. J. Dept. of Astrophysical Sciences.
SEC SENSOR PARAMETRIC TEST AND EVALUATION SYSTEM Final Report, 29 Apr. 1976 - 29 Jan. 1977
7 Mar. 1978 175 p refs
(Contract NAS5-23386)
(NASA-CR-166737) Avail: NTIS HC A08/MF A01 CSCL 14B

This system provides the necessary automated hardware required to carry out, in conjunction with the existing 70 mm SEC television camera, the sensor evaluation tests which are described in detail. The Parametric Test Set (PTS) was completed and is used in a semiautomatic data acquisition and control mode to test the development of the 70 mm SEC sensor, WX 32193. Data analysis of raw data is performed on the Princeton IBM 360-91 computer. T.M.

N82-10382# Michigan Univ., Ann Arbor.
PRECISION POSITRON POLARIMETRY: A NEW TECHNIQUE IN WEAK-INTERACTION STUDIES Final Report, 1 Jul. 1979 - 1 Jul. 1981
D. E. Newman and A. Rich Jun. 1981 13 p refs
(DE81-027435: DOE/ER-10451/2) Avail: NTIS HC A02/MF A01

The development of the positron polarization comparator is described. It consists of a magnetic (ALPHA)-ray spectrometer coupled to a positron polarimeter. This device is capable of comparing the polarization of positrons from two different nuclei to an accuracy which we estimate to ultimately reach 2 x 10(+4), thus enabling investigations of weak interaction features previously inaccessible to experiment. The current comparator system, including the results of studies of the systematic effects to be anticipated in such devices, is described. DOE

N82-10383# Sandia Labs., Albuquerque, N. Mex.
TRANSIENT TEMPERATURE RESPONSE OF STRAIN GAGES
P. H. Adams 1981 14 p refs Presented at the BSSM-SEASA Intern. Conf., Edinburgh, 31 Aug. 1981
(Contract DE-AC04-76DP-00789)
(DE81-767387; SAND-80-2689C; CONF-810807-1) Avail: NTIS HC A02/MF A01

When an electrical resistance strain gage bonded to a material is subjected to a temperature change, the resistance of the strain gage changes even though the material is free of stress. This temperature-induced resistance change is generally expressed in strain units and is commonly called apparent strain or thermal output. The thermal expansion coefficients and the temperature coefficient of resistance are temperature dependent quantities and not necessarily linearly related to temperature. For transient temperature conditions, the two temperatures are different. The magnitude and effect of the temperature difference on apparent strain is studied. DOE

N82-10384# Los Alamos Scientific Lab., N. Mex.
DESIGN AND FABRICATION OF A HIGH-DAMAGE THRESHOLD INFRARED SMARTT INTERFEROMETER
R. B. Hammond and A. J. Gibbs 1981 4 p refs Presented at the Conf. on Optics, Santa Fe, N. Mex., 7-10 Apr. 1981
(Contract W-7405-eng-36)
(LA-UR-81-1395; CONF-810429-27) Avail: NTIS HC A02/MF A01

A Smartt interferometer was investigated in terms of its use as a very precise alignment tool for infrared lasers. Particular emphasis was placed on its application to high power, fast pulse laser systems such as Helios and Antares. Results indicate that fabrication of structure with the unique optical characteristics of the Smartt interferometer combined with a very high optical damage threshold is necessary. DOE

N82-10385# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
PHASE A STUDY FOR THE SPACELAB EXPERIMENT: CONICAL SCAN RADIOMETER Final Report
Helmut Klostermann, Franz Pittermann, Wolfgang Ruehe, and Walter Schrieder Bonn Bundesministerium fuer Forschung und Technologie Dec. 1980 98 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-80-013; ISSN-0170-1339) Avail: NTIS HC A05/MF A01; Fachinformatinszentrum, Karlsruhe, West Germany DM 20,60

In order to map the total global radiation budget it is necessary to develop an instrument with an extremely broad spectral range (from 0.2 to 76 microns) and complete coverage of each ground path with as few orbits as possible. The number of measured radiation angles has to be maximum and the measuring principle should be independent of slow spacecraft yaw-motions. With respect to these requirements, different system concepts were investigated by means of efficiency analysis. The resulting most feasible concept is described in more detail and can be used as a baseline for a system definition study. Author (ESA)

N82-10386# Research Inst. of National Defence, Linkoeping (Sweden). Huvudavdelning 3.
DESCRIPTION OF A RADIOMETER FOR 94 GHz [BESKRIVNING AV RADIOMETER FOER 94 GHz]
Rolf Krook (Chalmers Univ. of Technology), Erik Kollberg (Chalmers Univ. of Technology), Lars-David Wernlund, and Gunnar Stenstroem Dec. 1980 47 p Partly in SWEDISH and ENGLISH
(FOA-C-30208-E1) Avail: NTIS HC A03/MF A01

The design and construction of a radiometer for 94 GHz is described. The radiometer is Dicke receiver and its temperature can be measured up to 876 K by double sideband techniques. R.C.T.

N82-10387# British Gas Corp., Newcastle-upon-Tyne (England). Engineering Research Station.
EFFECT OF TEMPERATURE ON VIBRATING WIRE STRAIN GAUGES
J. K. Marshall and P. Hunter Jan. 1980 12 p Submitted for publication
(ERS-E-240) Avail: NTIS HC A02/MF A01

Two methods of assessing true pipe strain values from indicated strain readings are outlined: a graphical analysis which tends to be intuitive, and a theoretical analysis which derives a solution from first principles. True strain in buried pipes is influenced by thermal effects due to changes in ground temperature and mechanical effects due to the constraints placed on the pipe by the surrounding soil. Both analyses consider the thermal and mechanical components of true strain, while the theoretical analysis enables these individual components to be determined from the indicated strain readings. Author (ESA)

N82-10388# Leeds and Northrup Co., North Wales, Pa.
MODIFICATION OF OPTICAL INSTRUMENTS FOR IN-STACK MONITORING OF PARTICLE SIZE Final Report, Sep. 1979 - Aug. 1980
A. L. Wertheimer Jun. 1981 46 p refs
(Contract EPA-68-02-3253)
(PB81-213373; EPA-600/2-81-096) Avail: NTIS HC A03/MF A01 CSCL 14B

A light scattering instrument for in-situ measurements of particles in the 0.2 to 20 micrometer diameter size range is described, and field test results are presented. The instrument is a modified version of an earlier prototype. The upper limit of the size response was extended from 10 to 20 micrometers, and several component and packaging changes were incorporated to make the unit more suited to stack particulate emission survey applications. The completed instrument was tested at a coal-fired electric power generating facility. A cascade impactor was used as a referee device and both instruments were run side by side in the outlet duct of the electrostatic precipitator. Results show an excellent correlation between the two instruments with regard to the identification of a 1 micrometers diameter peak in the particle size distribution. A second peak around 20 micrometers, defined by the optical instrument, could not conclusively be confirmed through the impactor data. GRA

N82-10986# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
AN OPTIMUM DESIGN PROCEDURE OF TOTAL-

TEMPERATURE THERMOCOUPLE PROBE
Liu Cihong and Zhao Jue-liang *In its* Recent Selected Papers of NW Polytech. Univ., pt. 1 (FTD-ID(RS)T-0259-81-Pt-1) 20 Aug. 1981 p 110-131 refs Transl. into ENGLISH from Recent Selected Papers of NW Polytech. Univ., pt. (Xian Shaanxi), 1979 (For primary document see N82-10980 01-99)
Avail: NTIS HC A17/MF A01

N82-10991# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE COMPUTATION OF INTEGRAL TYPE FLEXURE HINGE ASSEMBLY OF DYNAMICALLY TUNED GYROSCOPES
Mei Shuo-ji *In its* Recent Selected Papers of NW Polytech. Univ., pt. 1 (FTD-ID(RS)T-0259-81-Pt-1) 20 Aug. 1981 p 239-270 refs Transl. into ENGLISH from Recent Selected Papers of NW Polytech. Univ., pt. 1 (Xian Shaanxi), 1979 (For primary document see N82-10980 01-99)
Avail: NTIS HC A17/MF A01

36 LASERS AND MASERS

Includes parametric amplifiers.

N82-10389 California Inst. of Tech., Pasadena.
ULTRA-HIGH FREQUENCY DYNAMICS OF SEMICONDUCTOR INJECTOR LASERS Ph.D. Thesis
Kam-Yin Lau 1981 195 p
Avail: Univ. Microfilms Order No. 8118917

The basic analog modulation and transient characteristics of injection lasers with various structures are studied and compared. The basic limitations on ultrahigh frequency (> 5 GHz) modulation of lasers are considered. Self-pulsations in injection lasers are studied and their interaction with external cavities are clarified. These studies lead to the quenching of self-pulsation and ultra-short short pulse generation in laser diodes by coupling to an external cavity. A novel external fiber resonator is introduced for this purpose. Pattern effects in pulse code modulation of injection lasers are studied and a bipolar pulsing scheme devoid of the above effect is described. The transverse mode shift in a transverse junction laser under ultra-shot electrical pulse excitation is investigated. Finally, the frequency response of superluminescent lasers (lasers without mirrors) is analysed. Dissert. Abstr.

N82-10390*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ACTIVE LAMP PULSE DRIVER CIRCUIT Patent Application
K. Edward Logan, inventor (to NASA) (International Laser Systems, Inc.) Filed 24 Jun. 1981 24 p
(NASA-Case-GSC-12566-1; US-Patent-Appl-SN-276748) Avail: NTIS HC A02/MF A01 CSCL 20E

A flashlamp drive circuit is described in detail. The device uses an unsaturated transistor as a current mode switch to periodically subject a partially ionized gaseous laser excitation flash-lamp to a stable, rectangular pulse of current from an incomplete discharge of an energy storage capacitor. A monostable multivibrator sets the pulse interval, initiating the pulse in response to a flash command by providing a reference voltage to a non-inverting terminal of a base drive amplifiers. A tap on an emitter resistor provides a feedback signal sensitive to the current amplitude to an inventory terminal of the amplifier, thereby controlling the pulse amplitude. The circuit drives the flashlamp to provide a square-wave current flashlamp discharge. NASA

N82-10391# Schafer (W. J.) Associates, Inc., Wakefield, Mass.
LOW VOLTAGE FREE ELECTRON LASER. VOLUME 2: THEORY Final Report, 30 Apr. 1980 - 29 Apr. 1981
S. A. Mani and C. S. Chang 29 Jun. 1981 49 p refs
(Contract N00014-80-C-0515)
(AD-A103049; WJSA-FTR-81-168) Avail: NTIS HC A03/MF A01 CSCL 20/5

The theory of the low voltage free electron laser has been surveyed. The physics of trapping and high extraction are discussed. The technical issues connected with the two stage FEL optics are discussed. Author (GRA)

N82-10392# Illinois Univ., Urbana. Dept. of Electrical Engineering.
INVESTIGATION ON NON-GLASS LASER FUSION TARGETS: THEIR FABRICATION, CHARACTERIZATION, AND TRANSPORT Progress Report, 1 Jun. 1980 - 31 Jan. 1981
Kyekoon Kim 1981 86 p refs Prepared for Calif. Univ., Lawrence Livermore Lab., Calif.
(Contract W-7405-eng-48)
(DE81-026566; UCRL-15357; CPRLR-2-81) Avail: NTIS HC A05/MF A01

The development of techniques for fabricating, characterizing, and transporting laser fusion targets on a continuous basis was investigated. The target fabrication techniques are intended mainly for nonglass spherical shell targets, both cryogenic and noncryogenic. The following categories were investigated: (1) Liquid hydrogen behavior inside a spherical laser fusion target; (2) development of automated target characterization scheme; (3) cryogenic target fabrication scheme utilizing cold gas levitation and electric field positioning; (4) development of a cryogenic target fabrication system based on target free fall method; (5) generation of hydrogen powder using electrohydrodynamic spraying; (6) study of target charging techniques for application to contactless cryogenic target fabrication; and (7) development of hollow metal sphere production technique. DOE

N82-10393# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Chemistry.
LOW-PRESSURE APPROACH TO THE FORMATION AND STUDY OF EXCIPLEX SYSTEMS Final Report
George Sanzone Jun. 1981 59 p refs
(Contracts DE-AS02-76DP-40071; EY-76-S-02-2810)
(DE81-028316; DOE/DP-40071/T1) Avail: NTIS HC A04/MF A01

Development and construction of an experimental system for the study of the kinetics of excimers, and the validity of the low pressure approach to such studies was demonstrated. The apparatus consists of the following: (1) cluster molecular-beam souce of van der Waals dimers and higher oligomers; (2) modulated beam mass spectrometer; (3) low energy electron beam for the production of excimers; (4) vacuum ultraviolet to visible detection and photon counting system to monitor excimer emission; (5) flash excited tunable laser for studies of resonant self absorptions. The formation of Ar2 in its van der Waals ground state the productional $Ar2^*$ by electron bombardment of Ar2 and fluorescence and photon absorption of $Ar2^*$ are discussed. DOE

N82-10394# Sandia Labs., Albuquerque, N. Mex.
IMPROVED DATA-REDUCTION METHODS FOR LASER-PULSE-DIFFUSIVITY DETERMINATION WITH THE USE OF MINICOMPUTERS
J. A. Koski 1981 27 p refs Presented at the Intern. Joint Conf. on Thermophys. Properties, Gaithersburg, Md., 15 Jun. 1981
(Contract DE-AC04-76DP-00789)
(DE81-024070; SAND-80-2602C; CONF-810683-2) Avail: NTIS HC A03/MF A01

A generalized approach for obtaining simultaneous laser pulse time and radiative heat loss corrections for an arbitrary laser pulse shape is developed. A large scale computer is used to calculate convolution integral solutions and generate correction factors. The results are then put into a form convenient for minicomputers. A parameter estimation theory approach to data reduction presented as an alternative to the methods of Cowan, or Clark and Taylor, involves fitting an analytical solution to experimental data by minimizing the mean square error between the two. Thermal diffusivity and radiative loss factor are determined simultaneously from a solution form which includes laser pulse time corrections. The use of nonrecursive linear digital noise filters based on finite Fourier transform techniques is also discussed as a method for smoothing of data on minicomputers. Some results obtained for pulse diffusivity data with the use of a filter with hanning window characteristics are presented. DOE

N82-10395# Oak Ridge National Lab., Tenn. Analytical Chemistry Div.
SIMPLE OPTOACOUSTIC ENERGY METER FOR PULSED LASERS

Robert W. Shaw 1981 8 p refs Presented at the 2nd Intern. Photoacoustic Spectry. Conf., Berkeley, Calif., 22 Jun. 1981
(Contract W-7405-eng-26)
(DE81-024122; CONF-810630-6) Avail: NTIS HC A02/MF A01

The instrument's sensitivity is 0.24 microjoule noise equivalent energy and its accuracy is + or - 5% over 3.5 decades. The design of the instrument is described along with cost estimates for production. T.M.

N82-10396# *Research Inst. of National Defence, Linkoeping (Sweden). Huvudavdelning 3.*
TESTS WITH LASER BATHYMETRY [FOERSOEK MED LASERBATYMETRI]
Goeran Bolander, Haakan Klevebrant, Joergen Lexander, Ove Steinvall, Anders Widen, and Tryggve Ramquist Jul. 1980 40 p refs In SWEDISH
(FOA-C-30196-E1) Avail: NTIS HC A03/MF A01

Tests with an airborne laser were carried out in order to check this method for maritime close-watch and reconnaissance missions as well as for seabottom charting. The obtained depth-range was limited, owing to certain electric disturbances, to about 12 m from an altitude of 100 m, which in this case corresponds to about six attenuation-lengths. Extrapolation of the obtained data and also a theoretical analysis indicate that it is quite possible to reach 15 to 20 attenuation-lengths, which for typical Baltic Sea water corresponds to a depth of up to 40 m. With regard to the Baltic Sea, the best transmission occurs for wavelengths of 540 to 560 nm. Author (ESA)

N82-10397# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Abteilung Forschungsanlagen.
THEORY AND CONSTRUCTION OF A TWO-COMPONENT LASER VELOCIMETER
Jens-Carten Petersen Feb. 1981 31 p refs In GERMAN; ENGLISH summary
(DFVLR-Mitt-81-06) Avail: NTIS HC A03/MF A01; DFVLR, Cologne DM 6.40

The principle of a crossbeam laser anemometer is described in simplified form. The theory is based on DISA two-color optics and is conceived for the simultaneous determination of two velocity components. Exact optical adjustment is supposed for training the DISA optics. This is of particular importance to the derived interference line interval and the Bragg cell orientation. The electronics necessary for signal conditioning are also described, and the construction of a complete measuring system is discussed, including software, relative to an already existing laser velocimeter for one component. Author (ESA)

N82-10398# Quantronix Corp., Smithtown, N.Y.
DUAL WAVELENGTH LASER THERMAL PROCESSING OF SEMICONDUCTORS Final Report
Martin G. Cohen, Kuo-Ching Liu, and Robert A. Kaplan Jun. 1980 46 p refs
(Grant NSF DAR-79-17090)
(PB81-218000; NSF/RA-800540) Avail: NTIS HC A03/MF A01 CSCL 13H

The annealing of ion implantation damage in semiconductors by laser irradiation is optimized by employing a dual wavelength laser source and tailoring the time delay between pulses at the two wavelengths. The strong temperature dependence of the absorption coefficient for the initially less strongly absorbed wavelength is neutralized. A solid state laser emitting high intensity was used in conjunction with an optical fiber delay line to study the annealing characteristics of an arsenic implanted silicon solar cell wafer. The results are in agreement with a theoretical model based on melting and liquid phase epitaxial regrowth. GRA

N82-10399 California Inst. of Tech., Pasadena.
(AlGa)As SEMICONDUCTOR LASERS AND INTEGRATED OPTOELECTRONICS Ph.D. Thesis
Daniel Paul Wilt 1981 146 p
Avail: Univ. Microfilms Order No. 8119593

The design, fabrication, and testing of the first monolithic integrated optical repeater is described. The use of ion implantation as a technique to fabricate both lasers and field effect transistors is discussed. A theoretical model of the double heterostructure laser is given which treats the p-n junction in the device correctly by using fundamental semiconductor relationships and reasonable assumptions about the device heterointerfaces. The effect of lateral carrier diffusion upon the modulation characteristics of the semiconductor laser is discussed. An approach to effective permittivity formalism is presented which clarifies and extends the use of this technique particularly in the treatment of waveguiding in the semiconductor laser. Dissert. Abstr.

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N82-10400 *Polish Academy of Sciences, Warsaw. Inst. Podstawowych Problemow Techniki.*
EVALUATION OF MECHANICAL RATCHETING USING ENDOCHRONIC THEORY Ph.D. Thesis
Tetsuo Nashiro 1981 93 p refs
(ISSN-0208-5658) Copyright. Avail: Issuing Activity

A material deformation phenomenon (ratcheting) is described which results from a condition of steady stress with superposed cyclic high stress. A nonlinear endochronic theory was constructed to describe the nonlinear dependence of ratchet strain on the steady stress. The stress-strain curves at each cycle are also incorporated in the model, and cyclic hardening and softening are discussed. Finally, the effectiveness of endochronic theory applied to the multiaxial loading case is determined. M.G.

N82-10401*# Cleveland State Univ., Ohio. Dept. of Mechanical Engineering.
A MULTI-PURPOSE METHOD FOR ANALYSIS OF SPUR GEAR TOOTH LOADING Final Report
R. Kasuba, J. W. Evans, R. August, and J. L. Frater Oct. 1981 106 p refs
(Contract NAS3-18547)
(NASA-CR-165163) Avail: NTIS HC A06/MF A01 CSCL 13I

A large digitized approach was developed for the static and dynamic load analysis of spur gearing. An iterative procedure was used to calculate directly the 'variable-variable' gear mesh stiffness as a function of transmitted load, gear tooth profile errors, gear tooth deflections and gear hub torsional deformation, and position of contacting profile points. The developed approach can be used to analyze the loads, Hertz stresses, and PV for the normal and high contrast ratio gearing, presently the modeling is limited to the condition that for a given gear all teeth have identical spacing and profiles (with or without surface imperfections). Certain types of simulated sinusoidal profile errors and pitting can cause interruptions of the gear mesh stiffness function and, thus, increase the dynamic loads in spur gearing. In addition, a finite element stress and mesh subprogram was developed for future introduction into the main program for calculating the gear tooth bending stresses under dynamic loads. A.R.H.

N82-10402*# Lockheed Missiles and Space Co., Sunnyvale, Calif.
MODULAR ANTENNA DESIGN STUDY Final Report
John W. Ribble Sep. 1981 202 p refs
(Contract NAS1-14887)
(NASA-CR-3316; LMSC-D714622) Avail: NTIS HC A10/MF A01 CSCL 13I

The mechanical design of a modular antenna concept was developed sufficiently to allow manufacture of a working demonstration model of a module, to predict mass properties, and to make performance estimates for antenna reflectors composed of these modules. The primary features of this concept are: (1) each module is an autonomous structural element which can be attached to adjacent modules through a three point connection; (2) the upper surface is a folding hexagonal truss plate mechanism which serves as the supporting structure for a reflective surface; and (3) the entire truss and surface can

be folded into a cylindrical envelope in which all truss elements are essentially parallel. The kinematic studies and engineering demonstration model fully verified the deployment kinematics, stowing philosophy, and deployment sequencing for large antenna modules. It was established that such modules can be stowed in packages as small as 25 cm in diameter, using 1.27 cm diameter structural tubes. The development activity indicates that this deployable modular approach towards building large structures in space will support erection of 450 m apertures for operation up to 3 GHz with a single space shuttle flight. A.R.H.

N82-10403# Encotech, Inc., Schenectady, N.Y.
COMBUSTION TURBINE COMBINED-CYCLE R AND D PROJECT PRIORITY ANALYSIS Final Report
K. S. Deligiannis and J. Patmore, (Systems Control, Inc., Palo Alto, Calif.) Jul. 1981 237 p refs Sponsored by Electric Power Research Inst.
(EPRI Proj. 990-4)
(DE81-904206; EPRI-AP-1943) Avail: NTIS HC A11/MF A01

The development of a Computerized priority methodology for combustion Turbine R nd D projects was studied. The development of reliable and cost effective combustion turbine combined cycle systems is discussed. Time and funds to meet this development goal are limited, a method to prioritize potential R and D projects is highly desirable. The methodology includes a combined cycle plant simulation model (CCPSM) and a prioritization algorithm that ranks alternatives based on their benefit/cost effectiveness. DOE

N82-10404# Westinghouse Electric Corp., Tampa, Fla. Nuclear Equipment Div.
DEVELOPMENT OF AUTOMATED WELDING PROCESS FOR FIELD FABRICATION OF THICK WALLED PRESSURE VESSELS
R. A. Schneider 1981 13 p
(Contract DE-AC05-78ET-13511)
(DE81-028914; DOE/ET-13511/T8) Avail: NTIS HC A02/MF A01

Four tasks are reported on: (1) review of welding processes; (2) adaptation of the GTAW-HW narrow groove process to vertical and horizontal welds; (3) 8-inch thick field demonstration/ quaiification welds; and (4) welding procedure handbook. DOE

N82-10405# Westinghouse Electric Corp., Concordville, Pa. Combustion Turbine Systems Div.
ADVANCED COOLING FULL-SCALE ENGINE DEMONSTRATION PROGRAM Final Report
Jul. 1981 240 p refs Sponsored by Electric Power Research Inst.
(EPRI Proj. 1319-2)
(DE81-904240; EPRI-AP-1933) Avail: NTIS HC A11/MF A01

A cooling technology for vanes, blades and associated hot section components of a combustion turbine was developed. Three advanced cooling concepts were investigated for application over a maximum metal temperature range of 1100 to 15000 F: Lamilloy Spar, Shell/Spar and Hybrid. The susceptibility of transpiration cooled vanes to plugging in a residual oil combustion environment was determined. The engine modifications were defined. The Shell/Spar concept at 1500 F maximum metal temperature was selected for detailed design and fabrication. Temperature selection is based on performance and corrosion considerations. A design criteria for fabricating the Shell/Spar blades and vanes is developed. DOE

N82-10406# General Electric Co., St. Petersburg, Fla. Gas Turbine Div.
WATER-COOLED GAS TURBINE DEVELOPMENT PROGRAM Final Report
Jun. 1981 249 p Sponsored in part by Electric Power Research Inst. 2 Vol.
(EPRI Proj. 234-3)
(DE81-904245; EPRI-AP-1889-Vol-1) Avail: NTIS HC A11/MF A01

Work on the EPRI water cooled gas turbine development program, RP234 is summarized. The viability of water cooling to achieve higher firing temperatures and increased fuels flexibility in utility gas turbines was established. It is found that water cooling is a viable concept and that it results in considerable improvements in gas turbine combined cycle efficiency at increased firing temperatures. DOE

N82-10407# General Electric Co., St. Petersburg, Fla. Gas Turbine Div.
WATER-COOLED GAS TURBINE DEVELOPMENT PROGRAM Final Report
Jul. 1981 651 p refs Sponsored in part by Electric Power Research Inst. 2 Vol.
(EPRI Proj. 234-3)
(DE81-904229; EPRI-AP-1889-Vol-2) Avail: NTIS HC A99/MF A01

Descriptions of the test rigs, experimental procedures, and data acquired during the testing of the water cooled gas turbine are presented. Areas of turbine design that required further information and detailed data of a complete gas turbine are identified. These areas include: water heat transfer in rotating buckets; transfer of cooling water to the turbine rotor; distribution of the water to individual cooling passages in the buckets; collection of unvaporized water from the bucket tips; the influence of water on rotor and bucket vibration; water purity requirements to limit deposition in cooling passages; water erosion of turbine materials; and the establishment of proper blading surface temperatures to minimize hot corrosion and ash deposition from contaminated fuels. DOE

N82-10408# Centre Technique des Industries Mecaniques, St. Etienne (France).
EVALUATION OF LUBRICANTS FOR AIR COMPRESSORS Final Report [EVALUATION DES LUBRIFIANTS POUR COMPRESSEURS D'AIR]
N. Ollier and J. G. Schamelhout Sep. 1979 321 p refs In FRENCH
(CETIM-12-E-12-0) Avail: NTIS HC A14/MF A01

Given the lubricant requirements specific to the domain of application (reciprocating air compressors; centrifugal or turbo air compressors) methods of evaluation and tests are proposed. These methods were applied in the laboratory to products considered representative of the principal families of lubricants commonly in use. Lubricating performance of these products is disclosed. Author (ESA)

N82-10409# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Berlin (West Germany). Abt. Turbulenzforschung, Berlin.
NOISE REDUCTION IN CENTRIFUGAL FANS BY USE OF RESONATORS
Wolfgang Neise and Gary H. Koopmann (Houston Univ.) Mar. 1981 53 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-723)
(DFVLR-FB-81-09) Avail: NTIS HC A04/MF A01; DFVLR, Cologne DM 9.20

The significant reduction of aerodynamically generated blade passage noise at the source by mounting a lambda/4 resonator at the cut-off lip on centrifugal fans is considered. While preserving the original cut-off lip geometry, the perforated mouth of the resonator now forms the lip. The resonator can be tuned to various frequencies, e.g., the blade passage frequency, via a moveable end plug, enabling reductions in tone intensity of up to 29 dB. Attenuation of a somewhat lesser degree occurs within a frequency band about the resonance frequency. The bandwidth of the resonator response is influenced by the porosity of the resonator mouth. Author (ESA)

N82-10992# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
A THEORETICAL ANALYSIS OF INVOLUTE HARMONIC GEARING
Shen Yunwen *In its* Recent Selected Papers of NW Polytech. Univ., pt. 1 (FTD-ID(RS)T-0259-81-Pt-1) 20 Aug. 1981 p 271-314 refs Transl. into ENGLISH from Recent Selected Papers of NW Polytech. Univ., pt. 1 (Xian Shaanxi), 1979 (For primary document see N82-10980 01-99)
Avail: NTIS HC A17/MF A01

N82-11002# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE STUDY ON TECHNOLOGICAL FUNDAMENTALS OF PULSED SPRAY TRANSFER ARC WELDING (IV). OBSERVATIONS ON ARC PHENOMENA IN THE CASE OF STABLE WELDING CONDITION
Duan Liyu, Cheng Gongshou, Feng Jijiang, Wang Xuxi, and Lu Xuezhen *In its* Recent Selected Papers of NW Polytech. Univ., pt. 2 (FTD-ID(RS)T-0260-81-Pt-2) 28 Aug. 1981 p 197-236 refs Transl. into ENGLISH from Recent Selected Papers of NW Polytech. Univ., pt. 2 (Xian Shaanxi), 1979 (For primary document see N82-10996 01-99)
(Rept-1) Avail: NTIS HC A18/MF A01

N82-11003# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
A FAST FOURIER TRANSFORM HARDWARE PROCESSOR
Kang Ji-Chang and Xu Naiping *In its* Recent Selected Papers of NW Polytech. Univ., pt. 2 (FTD-ID(RS)T-0260-PT-2) 28 Aug. 1981 p 237-252 refs Transl. into ENGLISH from Recent Selected Papers of NW Polytech. Univ., pt. 2 (Xian Shaanxi), 1979 (For primary document see N82-10996 01-99)
Avail: NTIS HC A18/MF A01

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N82-10410 Drexel Univ., Philadelphia, Pa.
THE UTILIZATION OF SIGNAL PROCESSING AND PATTERN RECOGNITION FOR THE ADVANCEMENT OF ULTRASONIC NONDESTRUCTIVE TESTING Ph.D. Thesis
Michael Joseph Avioli, Jr. 1981 155 p
Avail: Univ. Microfilms Order No. 8118925

Different technologies that utilize signal processing and pattern recognition to use these desciplines to advance the state of the art in flaw and material classification in ultrasonic inspection are presented. The availability of suitable tools for analysis, and two sample problems that can be handled with this integrated technology are described. The two problems are related to weld inspection, the first on welded plates, and the second for K joint damage analysis in an offshore structure. The development of a system software package the Generalized Approach to New Problems in Ultrasonic Inspection (GANPUI) is described.
Dissert. Abstr.

N82-10411# Westinghouse Electric Corp., Mercury, Nev. Advanced Energy Systems Div.
QUALITY-ASSURANCE PROGRAM PLAN
R. A. Kettell May 1981 74 p
(Contract DE-AC08-80NV-10061)
(DE81-028257; DOE/NV-10061/7) Avail: NTIS HC A04/MF A01

The quality assurance program which is applied to radioactive waste management activities conducted at the Nevada test site is presented. The systematic and administrative controls to assure quality, safety, reliability, and maintainability during design, procurement, fabrication, inspection, shipments, tests, and storage are described.
DOE

N82-10412# Engins Matra, Velizy (France).
MILITARY COMPONENTS POLICY. GENERAL REFLECTIONS ON THE DEFINITION OF PROCEDURES FOR TROUBLESHOOTING MILITARY EQUIPMENT [POLITIQUE COMPOSANTS MILITAIRES. REFLEXION GENERALE POUR LA DEFINITION DE PROCEDURES DE DEVERMINAGE D'EQUIPEMENTS MILITAIRES]
J. Ringler 22 Aug. 1980 18 p In FRENCH
Avail: NTIS HC A02/MF A01

Debugging profiles which represent a compromise between cost and effectiveness, specific to military equipment developed by MATRA, are proposed. Principally, electronic equipment (computers, automatic pilots, power supply circuits, etc.) is considered. The objectives of troubleshooting are defined, and a mathematical model of test procedure effectiveness is given. After reviewing those factors which favor effective debugging, MATRA equipment test programs were drawn up, and a scheme for determining their validity is suggested.
Author (ESA)

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance*.

N82-10413 California Univ., Davis.
THE INFLUENCE OF END FRICTION AND LENGTH-TO-DIAMETER RATIO ON THE BEHAVIOR OF CONCRETE CYLINDERS Ph.D. Thesis
Islam Ahmed Basunbul 1981 216 p refs
Avail: Univ. Microfilms Order No. 8117558

Separate experiments were performed to evaluate the friction coefficients of steel heads with five different controlled surface textures and on Teflon pads. Three different sizes of concrete cylinders were loaded to failure. Axial and lateral deformations and failure patterns were studied. Incremental finite element analyses with nonlinear modeling of the concrete materials were performed taking into consideration the size and the different friction constraints at the ends of the test specimen. Results indicate that for concrete cylinders with a length to diameter ratio of 2 or more, friction is not significant in compression. However, as the L/D ratio decreases, the influence of friction rapidly becomes very significant.
Dissert. Abstr.

N82-10414 Pennsylvania Univ., Philadelphia.
THE STATISTICS OF THE OCEAN WAVE-CURRENT FORCE WITH APPLICATION TO OFFSHORE STRUCTURES Ph.D. Thesis
Haym Benaroya 1981 213 p
Avail: Univ. Microfilms Order No. 8117756

A nonlinear, statistical model for the loadings on offshore structures due to ocean waves and currents is developed. System parameters are treated as random variables, and the responses of specific structures to this model are determined. The areas considered are: the wave force, the wave-current force, the effect of a nonrigid structure on fluid-structure interaction; vortex shedding forces; and the application of the force model to representative structures.
Dissert. Abstr.

N82-10415 Virginia Univ., Charlottesville.
VIBRATIONS OF LOCALLY MODIFIED MECHANICAL AND STRUCTURAL SYSTEMS Ph.D. Thesis
Alan Brian Palazzolo 1981 308 p
Avail: Univ. Microfilms Order No. 8117919

Several approximate reanalysis procedures for solving the free and harmonically forced response problems of damped, unsymmetric systems are developed. By fully exploiting the sparsity of the modifications to these systems, the procedures are computationally efficient. The modified systems are condensed by employing generalized receptance matrix elements. An improved hybrid spectral - property matrix receptance formalism is derived. This formalism is applicable to the general, unsymmetric, quadratic eigenvalue problem. Also, algorithms for eigensolution component synthesis, eigenvalue design, and forced harmonic response design are developed. The design methods should be useful tools to designers of active or passive vibration control devices. These algorithms may also be directly applied to system parameter identification schemes. The results demonstrate that by applying the reanalysis and design schemes to the search for an optimized structural design, the computational efficiency may be substantially increased over standard exact solution techniques.
Dissert. Abstr.

N82-10416 Virginia Polytechnic Inst. and State Univ., Blacksburg.
A MODELING TECHNIQUE FOR SUBSONIC STALL FLUTTER IN CASCADES Ph.D. Thesis

John Francis Sparks 1981 123 p
Avail: Univ. Microfilms Order No. 8118715

By combining a dynamic stall model with the equations of motion for a two-dimensional cascade of blades, a model was created which simulated torsional self-excited vibration of the cascaded blades. The lift and moment coefficients were correlated in Fourier magnitude and phase form with the reduced frequency, mean incidence angle, and the magnitude of the incidence angle change during the airfoil oscillation at a given Mach number. By calculating the inverse transform, it was then possible to closely reproduce the values of the lift and moment coefficients for the blade at any time during its oscillation. The motion of each blade in the cascade was determined by simultaneously integrating the equation of motion of every blade in the cascade. Values of lift and moment from the dynamic stall segment of the model were used to determine the external moment on the blades. These values were constantly updated at each time step as the blades responded. A uniform upstream flow was assumed and the effects of the blade movement on the flow in the blade passage were transmitted through a blade coupling term which was dependent upon the relative rate of oscillation of the adjacent blades. A rotating test rig was used to verify the model.
Dissert. Abstr.

N82-10417 Pennsylvania Univ., Philadelphia.
CYCLIC DEFORMATION AND STRAIN LOCALIZATION IN AL-4WT PERCENT CU ALLOY CONTAINING THETA DOUBLE PRIME PRECIPITATES Ph.D. Thesis
Jia-Kuen Jerry Lee 1981 283 p
Avail: Univ. Microfilms Order No. 8117806

The cyclic deformation of single crystals and polycrystals was explored in strain controlled tests for plastic resolved shear strains. The mechanism of cyclic softening is discussed. The cyclic stress strain curves (CSS curves) of the monocrystalline and polycrystalline material are similar. Both show plateau behavior; at strains both higher and lower than the plateau the cyclic flow stress increases with strain amplitude. The slip step heights produced by the quarter cycles were replicated to measure the strain localized in the persistent slip bands (PSB's) measured by interferometry and correlated with the applied plastic strain. It was thus found: that (1) after the peak, essentially all the plastic strain is carried by the PSB's; (2) they are segmented into micro PSB's; (3) their volume fraction is very low throughout the plateau; and (4) the localized strain varies between 0.3 and 0.6, two orders of magnitude higher than in copper. This results in crack nucleation within the PSB's and, the fatigue life is very low. However, just like in copper single crystal, the life is described by the Coffin-Manson law. Dissert. Abstr.

N82-10418 Texas Univ. at Arlington.
A FINITE ELEMENT ANALYSIS FOR PROBLEMS OF LARGE STRAIN AND LARGE DISPLACEMENT Ph.D. Thesis
Amin Saleh Aly 1981 139 p
Avail: Univ. Microfilms Order No. 8119252

The principle of virtual work, set in a Lagrangian frame of reference, is used for a finite element formulation of nonlinear boundary value problems for hyperelastic materials at large strains. The formulation is applicable to a general isotropic form of the strain energy function, and uses the Newton Raphson technique for incremental iterative analysis. In the discrete problem, two models are considered to simulate the behavior of rubber-like materials. The first model is a displacement model that has the displacement as the only variable. The second model is a mixed model that has both the displacement and hydrostatic pressure as variables. The performances of the eight-node serendipity element and the nine-node Lagrangian element are discussed. The formulation of the finite element scheme is completely consistent with the virtual work equations. This consistency leads to a good accuracy and rapid convergence of the computations.
Dissert. Abstr.

N82-10419 Louisiana State Univ. and A&M Coll., Baton Rouge.
AN EXPERIMENTAL EVALUATION OF NEUBER'S CYCLIC RELATION AT ROOM AND ELEVATED TEMPERATURE Ph.D. Thesis
Michael Wade Guillot 1981 152 p
Avail: Univ. Microfilms Order No. 8117628

The four quantities incorporated in Neuber's cyclic relation were measured so that a direct evaluation of the relation could be made. Three of the parameters were measured during tests lasting a thousand cycles on notched specimens run under completely reversed load control. These three were the stress and strain in the specimen far removed from the notch and the strain at the edge of the notch. The latter value was obtained using a novel laser based interferometric technique. The fourth parameter, stress at the notch, was inferred from load data taken on a small, smooth specimen which was subjected to the strains measured at the notch. These measurements were conducted on specimens manufactured from three different materials, with two notch geometries, and run at both room and elevated temperatures. After having recorded this data, Neuber's rule was used to compute a value for numerous cycles of each test which was then compared to the theoretical stress concentration factor. Results showed that Neuber's parameter was generally less than the stress concentration factor regardless of material, notch geometry, or temperature and is, therefore, a conservative design criterion. Dissert. Abstr.

N82-10420 Louisiana State Univ. and A&M Coll., Baton Rouge.
SOME PROBLEMS IN ONE AND TWO-DIMENSIONAL COUPLED THERMOELASTICITY Ph.D. Thesis
Abdel Hassan Ghosn 1981 124 p
Avail: Univ. Microfilms Order No. 8117625

The one-dimensional, cylindrical, quasi-static, coupled thermoelastic problem is considered. The temperature and displacement fields in an infinitely long solid cylinder, and an infinite medium with a cylindrical hole whose boundaries are subjected to a time dependent function, are presented. These results, under the appropriate assumptions and loadings, are identical to published results. Also presented is the general solution in the transform domain for the two-dimensional cartesian plane strain coupled thermoelastic problem. As an application, the Lamb plane problem is treated under two loading conditions. The method used in both cases is the so-called direct approach, that is Laplace transform without resorting to the commonly used thermoelastic potential function. Dissert. Abstr.

N82-10421# Shock and Vibration Information Center (Defense), Washington, D. C.
THE SHOCK AND VIBRATION DIGEST, VOLUME 13, NO. 9
Judith Nagle-Eshleman, ed. Sep. 1981 123 p refs
(AD-A105062) Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375; $15.00/set CSCL 20/11

Structural dynamic problems inherent to design, analysis, and operation of rotating machinery were investigated. The following Space Shuttle related problems are discussed: analytical and experimental loads, and dynamics efforts; development of data systems and environmental testing programs; Space Shuttle thermal protection system and the Space Shuttle main engine; structural dynamics, dynamic testing, and vibration control. For individual titles, see N82-10422 through N82-10424.

N82-10422# Polish Academy of Sciences, Warsaw.
LINEAR DYNAMIC THERMOELASTICITY: A SURVEY
J. Ignaczak *In* Shock and Vibration Information Center (Defense) The Shock and Vibration Dig., Vol. 13, No. 9 Sep. 1981 p 3-8 refs (For primary document see N82-10421 01-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375; $15.00/set CSCL 20/11

The historical development of linear dynamic thermoelasticity was surveyed. A linear theory of nonsteady heat conduction is combined with elastodynamics to describe thermomechanical processes in a solid body. Problems concerning periodic thermoelastic disturbances were solved. The periodicity hypothesis allows reduction of governing equations to classical Helmholtz equations with complex valued wave numbers and application of the classical elastodynamics to solve actual problems. Descriptions of fundamental results and of a basic system of field equations for dynamic thermoelasticity with relaxation times are surveyed.
E.A.K.

N82-10423# Ohio State Univ., Columbus.
PLATE VIBRATION RESEARCH, 1975 - 1980: CLASSICAL THEORY
A. W. Leissa *In* Shock and Vibration Information Center (Defense)

The Shock and Vibration Dig., Vol. 13, No. 9 Sep. 1981 p 11-22 refs (For primary document see N82-10421 01-39)
Avail: NTIS Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375; $15.00/set CSCL 20/11

The free transverse vibrations of plates was investigated. The following problems governed by the classical theory of plates are described: homogeneous, isotropic, thin, constant thickness, no inplane initial forces, small transverse displacements, vibrating in a vacuum. E.A.K.

N82-10424# Texas Technological Univ., Lubbock. Dept. of Mechanical Engineering.
PARAMETRIC VIBRATION. PART 6: STOCHASTIC PROBLEMS (2)
R. A. Ibrahim *In* Shock and Vibration Information Center (Defense) The Shock and Vibration Dig., Vol. 13, No. Sep. 1981 p 23-35 refs (For primary document see N82-10421 01-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375; $15.00/set CSCL 20/11

Developments in the mathematical theory of stochastic differential equations and of random processes in the study of dynamic systems driven by random parametric excitation are discussed. Progress was made in the analysis of stochastic stability of linear and nonlinear systems. New closure techniques to truncate the infinite hierarchy moments equations are established. The probability of the first passage time, the interaction between self excited and random parametric vibrations, and identification of oscillating and vibroimpact systems are reviewed. E.A.K.

N82-10425 Materials Research Labs., Melbourne (Australia).
USE OF WEIGHT FUNCTIONS TO DETERMINE THE STRESS INTENSITY FOR A CRACKED THICK-WALLED CYLINDER
Graham Clark May 1981 19 p refs
(MRL-R-814; AR-002-413) Copyright. Avail: Issuing Activity

The use of weight functions to determine stress intensities for cracked specimens is demonstrated. While the initial derivation of a suitable weight function for some specimen geometries may be complex, the technique offers substantial benefits. In particular, stress intensities may be estimated for any initial stress distribution, and variations in stress intensity which result from the introduction of residual stress fields may be handled without the need to perform a full re-analysis for each case. The stress intensity at the tip of a crack which grows through a known stress field is estimated using a weight function technique. The geometry considered is a thick-walled cylinder ($R_o/R_i = 1.8$) containing a longitudinal crack along the bore surface, and stress distributions corresponding to a variety of loading arrangements are used as examples. J.M.S.

N82-10426 Princeton Univ., N. J.
HIGH FIELD GRADIENT PHENOMENA IN NONLOCAL MEDIA Ph.D. Thesis
Nasit Cevat Ari 1981 143 p
Avail: Univ. Microfilms Order No. 8118344

The application of nonlocal theories to high field gradient phenomena was investigated. Formulation of nonlocal mixed boundary value problems is discussed. Crack problems provide high field gradient phenomena where nonlocal approach can be very useful. The solution of the nonlocal Griffith problem is given. It is found that the maximum stress is finite and away from the crack tip. The nonlocal solution to the propagating crack problem is utilized in Eringen'a fracture criterion to dynamic rupture phenomena. Dissert. Abstr.

N82-10427 Virginia Polytechnic Inst. and State Univ., Blacksburg.
RESPONSE OF SELF-EXCITED MULTIDEGREES-OF-FREEDOM SYSTEMS TO MULTIFREQUENCY EXCITATIONS Ph.D. Thesis
Khaled Rafiq Asfar 1981 184 p
Avail: Univ. Microfilms Order No. 8118685

The response of self excited multidegrees of freedom systems of the van der Pol type to multifrequency excitations was analyzed. A first order uniformly valid approximate solution is sought using the perturbation method of multiple scales. It is shown that the total response of such systems is composed of two parts: a free oscillation part with an amplitude and a phase that are functions of the excitations, and a forced response part. The first part can be quenched under certain conditions. A steady state response of the system is not periodic unless the frequencies of the resonant excitations are commensurable. It is also shown that the frequency response curves can be multivalued, indicating several possible solutions for the free-oscillation part, and that the multivaluedness increases for more degrees of freedom. Dissert. Abstr.

N82-10428 Texas Univ. at Arlington.
THE COMPUTATION OF BENDING SINGULARITIES IN ELASTIC PLATES USING BOUNDARY INTEGRAL TECHNIQUES Ph.D. Thesis
Jin-Woo Kim 1980 115 p
Avail: Univ. Microfilms Order No. 8119318

Boundary integral equations governing thin elastic plate flexure with singularities such as might occur at cracks or corners are formulated. The list of variables includes the singularity intensity parameters as well as displacement, normal slope, bending moment and equivalent shear on the plate boundary. The reciprocal work identity on which these equations are based is developed and extended to include boundary singularities. Two problems are treated in detail; the elastic plate with a through crack, and a simply supported rectangular reentrant corner. The kernel functions appropriate to these two cases are derived. A discretization scheme for solving the resulting system of coupled singular boundary integral equations and boundary conditions is proposed, and some numerical results are presented for the model problem of bending of a centrally cracked square plate. Dissert. Abstr.

N82-10429 Lehigh Univ., Bethlehem, Pa.
CIRCUMFERENTIAL CRACKS IN THICK-WALLED CYLINDERS: A GENERAL SOLUTION Ph.D. Thesis
Herman Frederick Nied 1981 126 p
Avail: Univ. Microfilms Order No. 8118845

A long hollow circular cylinder with a circumferential crack subjected to various symmetric and nonsymmetric external loads was investigated. The crack is circular or ring shaped and may be either an edge crack or a crack completely embedded in the cylinder wall. The three dimensional problem is based on the theory of elasticity and the techniques of integral transforms. It is shown that external edge cracks in hollow cylinders have greater stress intensity factors than inner radius edge cracks of the same length in both axial loading and in pure bending. It is demonstrated that for hollow cylinders with large radii to wall thickness ratios, results are obtained by using the two dimensional cracked strip solution. Dissert. Abstr.

N82-10430*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
CORNERING CHARACTERISTICS OF THE NOSE-GEAR TIRE OF THE SPACE SHUTTLE ORBITER
William A. Vogler (Kentron International, Inc., Hampton, Va.) and John A. Tanner Oct. 1981 29 p refs
(NASA-TP-1917; L-14681) Avail: NTIS HC A03/MF A01 CSCL 20K

An experimental investigation was conducted to evaluate cornering characteristics of the 32 x 8.8 nose gear tire of the space shuttle orbiter. Data were obtained on a dry concrete runway at nominal ground speeds ranging from 50 to 100 knots and over a range of tire vertical loads and yaw angles which span the expected envelope of loads and yaw angles to be encountered during space shuttle landing operations. The cornering characteristics investigated included side and drag forces and friction coefficients, aligning and overturning torques, friction force moment arm, and the lateral center of pressure shift. Results of this investigation indicate that the cornering characteristics of the space shuttle nose gear tire are insensitive to variations in ground speed over the range tested. The effects on cornering characteristics of variations in the tire vertical load and yaw angle are as expected. Trends observed are consistent with trends observed during previous cornering tests involving other tire sizes. Author

N82-10431# Denver Research Inst., Colo.
DESIGN AND FABRICATION OF AN X-RAY STRESS ANALYZER Final Report
C. Barrett, D. A. Steffen, R. E. Sturn, E. D. Wardzala, and K. C. Wasmundt Jun. 1981 92 p refs Sponsored by Electric

Power Research Inst.
(EPRI Proj. 823-1)
(DE81-903772; EPRI-NP-1873) Avail: NTIS HC A05/MF A01

To investigate feasibility of fabricating an X-ray stress analyzer for measuring residual stress in austenitic stainless steel pipe, stainless steel coupons were tested first, using a laboratory breadboard set up. Successful tests, as compared to electrical resistance strain gauges were followed by tests on sample specimens of ten-inch stainless steel BWR pipes which had been seam-welded. An X-ray stress analyzer for use with four-inch stainless steel BWR pipes was designed and partially assembled. Software was developed for automatic determination of the change in Debye ring diameter, including data smoothing and averaging calculations. DOE

N82-10432# Rochester Univ., N. Y. Dept. of Mechanical Engineering.
MATERIALS AND MECHANICS OF RATE EFFECTS IN FRACTURE Final Report, 1 Feb. 1974 - 14 Feb. 1981
S. J. Burns Jul. 1981 16 p refs
(Contract DE-AS02-76ER-02422)
(DE81-028489; DOE/ER-02422/29) Avail: NTIS HC A02/MF A01

Brittle fracture mechanics were studied. The following topics are discussed: dynamic analysis of rapidly wedged double cantilevered beam specimens; experimental measurements of stress intensity factors for a propagating brittle crack in steel at selected temperatures; elastic, nonlinear fracture analysis in a thermodynamic formalism using energy balances; mechanical fracture stability for either constant load or constant displacement specimens; measuring J/sub IC/ by recording the load versus the loadpoint displacement for two specimens with a finite difference in crack area; creep cracking and determination of the activation enthalpy for the rate controlling process in steady state crack propagation; experimental determination of the athermal component of the crack driving force establishing its temperature independence; and, elastic solutions for a single dislocation and arrays of dislocations at a sharp crack tip, proving crack tip dislocation shielding concept. DOE

N82-10433# Argonne National Lab., Ill. Applied Mathematics Div.
SECONDARY STATES OF VIBRATING PLATES
Bernard J. Matkowsky (Northwestern Univ.), Leonard J. Patrick (Siena Coll., Loudonville, N.Y.), and Edward L. Reiss (Northwestern Univ.) Aug. 1981 25 p refs
(Contract W-31-109-eng-38)
(DE81-029961; ANL-81-49) Avail: NTIS HC A02/MF A01

A previously developed perturbation method is used to obtain a class of periodic motions for the nonlinear vibrations of rectangular, elastic plates. The dynamic von Karman plate theory is used in the analysis. The solutions arise by secondary bifurcation from the periodic solutions that bifurcate from the natural frequencies of free vibrations of the linearized plate theory. The motions are a linear combination of two modes of the linearized theory. DOE

N82-10434# Sandia Labs., Albuquerque, N. Mex.
RESIDUAL STRESSES IN DARRIEUS VERTICAL AXIS WIND TURBINE BLADES
P. Veers Apr. 1981 63 p
(Contract DE-AC04-76DP-00789)
(DE81-1026144; SAND-81-0923) Avail: NTIS HC A04/MF A01

A numerical package called RESID was essential to calculate the residual stresses in VAWT blades induced during cold forming. Using a strength of materials - elementary beam theory approach, RESID models the material response with a bilinear stress-strain curve, and the cross sectional geometry with an array of area increments. Through an iterative solution procedure residual stresses are predicted for a specified final radius of curvature or applied bending moment. Results are compared to theoretical solutions for simple geometries and with MARC Finite element results for VAWT blade geometries. Calculating residual stress levels, determining acceptable residual stress levels, and a method of reducing residual stresses are discussed. A complete listing and sample run are inclined in the appendexes. DOE

N82-10435# Electric Power Research Inst., Palo Alto, Calif. Nuclear Power Div.
STRUCTURAL MECHANICS PROGRAM: PROGRESS IN 1980 Progress Report
R. E. Nickell, D. M. Norris, S. W. Tagart, Jr., and T. U. Marston Aug. 1981 138 p
(DE81-904244; EPRI-NP-1969-SR) Avail: NTIS HC A07/MF A01

The EPRI Structural Mechanics Program, to improve nuclear plant reliability and availability is discussed. The program includes characterization of materials, evaluation and analysis of flaws, and application and technology transfer. The largest efforts are: the development of statistically valid radiation embrittlement data base for evaluating the fracture toughness of irradiated pressure vessel steels and for evaluating damage annealing processes for embrittlement materials: the development of weld repair procedures for reactor pressure vessels as alternatives to the half bead repair method; the development of simplified design methodology for the prediction of crack initiation, stable crack growth, and instability of ductile material in the presence of flaws; and the development of methodology for predicting the growth and stability of stress corrosion cracks in large diameter stainless steel piping. DOE

N82-10436# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
INDENTATION AND EROSION OF BRITTLE MATERIALS Ph.D. Thesis
Moshen Ashrafi Khatibloo Jun. 1981 163 p refs
(Contract W-7405-eng-48)
(DE81-030351; LBL-11883) Avail: NTIS HC A08/MF A01

Indentation and erosion of brittle materials were studied. The mechanical behavior of brittle materials was studied and their various responses to loading were classified. Plasticity occurs whenever sharp or very small indenters are used. A model shows that cracks referred to as median vent, radial and multiple cone cracks initiate and propagate along paths close to the principal stress trajectories in the uncracked solid. However, this model gives only the initiation locations of lateral cracks. DOE

N82-10437# California Univ., Livermore. Lawrence Livermore Lab.
THEORETICAL STUDIES OF SHOCK DYNAMICS IN TWO-DIMENSIONAL STRUCTURES, 5: MICROSCOPIC CONSTRAINTS ON SHOCK-INDUCED SIGNALS
A. M. Karo, F. E. Walker, W. G. Cunningham, and J. R. Hardy (Nebraska Univ.) 18 Jun. 1981 14 p refs Presented at the APS Conf. on Shock Waves in Condensed Matter, Menlo Park, Calif., 23 Jun. 1981
(Contract W-7405-eng-48)
(DE81-024194; UCRL-85288; CONF-810684-17) Avail: NTIS HC A02/MF A01 .

Molecular dynamics calculations are presented that address the extent of microscopic detail that can be deduced from macroscopic gauge measurements of shock propagation in condensed systems. Large asymmetrically shock-loaded lattices were simulated, varying the initial temperature and the strength of shock loading. Randomly-placed mass defects were introduced into the lattice, and the degradation of the shock front with the subsequent development of fracture and chunky spall were studied and compared with the coherent microscopic spall found for perfect lattices. DOE

N82-10438# Sandia Labs., Albuquerque, N. Mex.
CRITERION FOR THERMO-PLASTIC SHEAR INSTABILITY
T. J. Burns, D. E. Grady, and L. S. Costin 1981 8 p refs Presented at the APS Conf. on Shock Waves in Condensed Matter, Menlo Park, Calif., 23 Jun. 1981
(Contract DE-AC04-76DP-00789)
(DE81-023178; SAND-81-0041C; CONF-810684-8) Avail: NTIS HC A02/MF A01

Dynamic torsional Kolsky bar experiments on thin walled tubes of 1018 cold rolled and 1020 hot rolled steel were modeled. A deformation plasticity theory which imcorporates a specific constitutive model for the shear stress in terms of strain strain rate, and temperature into a system of differential equations is applied. Stability diagrams of strain rate vs. strain are construc-

ted for the two types of steel using the criterion. It is found that the Kolsky bar data are consistent with the analysis. DOE

N82-10439# Sandia Labs., Albuquerque, N. Mex.
STRAIN-RATE EFFECTS IN BERYLLIUM UNDER SHOCK COMPRESSION
J. R. Asay, L. C. Chabildas, and J. L. Wise 1980 5 p refs Presented at the APS Conf. on Shock Waves in Condensed Matter, Menlo Park, Calif., 23 Jun. 1981
(Contract DE-AC04-76DP-00789)
(DE81-024080; SAND-80-2847C; CONF-810684-13) Avail: NTIS HC A02/MF A01

Shock wave experiments were conducted on beryllium over the range of 6 to 25 GPa. A steady wave analysis of the shock front was used to estimate effective viscosities during the loading process. The process varied approximately as the inverse square root of strain rate for strain rates greater than about 3 microns. DOE

N82-10440# Oak Ridge National Lab., Tenn. Metals and Ceramics Div.
PROGRESS IN UNDERSTANDING THE MECHANICAL BEHAVIOR OF PRESSURE VESSEL MATERIALS AT ELEVATED TEMPERATURES
R. W. Swindemann and C. R. Brinkmen 1981 19 p refs Presented at the ASME PVP Conf., Denver, 21 Jun. 1981
(Contract W-7405-eng-26)
(DE81-024128; CONF-810625-18) Avail: NTIS HC A02/MF A01

High temperature mechanical properties data for pressure vessel materials were reviewed. Satisfying new data requirements to implement advances in high temperature inelastic design methods was investigated. Servocontrolled testing machines and high resolution extensometry were developed to gain more information on the essential behavioral features of high temperature alloys. The similarities and differences in the mechanical response of various pressure vessel materials were identified. DOE

N82-10441# General Atomic Co., San Diego, Calif.
EFFECT OF COUPLE-STRESS ON THE PURE BENDING OF A PRISMATIC BAR
F. Tzung, B. Kao, F. Ho, and P. Tang Feb. 1981 10 p refs Presented at the 6th Intern. Conf. on Struct. Mech. in Reactor Technol., Paris, 17 Aug. 1981
(Contract DE-AT03-76ET-35300)
(GA-A-16001; CONF-810801-34) Avail: NTIS HC A02/MF A01

An evaluation of the applicability of the couple-stress theory to the stress analysis of graphite structures is performed by solving a pure bending problem. The differences between solutions from the couple-stress theory and from the classical theory of elasticity are compared. It is found that the differences are sufficient to account for the inconsistencies which have often been observed between the classical elasticity theory and actual behavior of graphite under bend and tensile loadings. An experimental procedure to measure the material constants in the couple-stress theory is also suggested. The linear couple-stress theory, the origins of which go back to the turn of the last century, adds linear relations between couple-stress and rotation gradients to the classical stress-strain law. By adopting the classical assumption that the plane cross section remains plane after deformation, the pure-bending problem is reduced to a plane couple-stress problem with traction-free boundary conditions. Dissert. Abstr.

N82-10442# Sandia Labs., Albuquerque, N. Mex.
RESULTS OF FULL-SCALE TURBINE MISSILE CONCRETE IMPACT EXPERIMENTS
Ronald L. Woodfin and George E. Sliter (Electric Power Research Inst., Palo Alto, Calif.) 1981 9 p refs Presented at the 6th Intern. Conf. on Structural Mech. in Reactor Technol., Paris, 17 Aug. 1981
(Contract DE-AC04-76DP-00789)
(SAND-81-0353C; CONF-810801-12) Avail: NTIS HC A02/MF A01

Four full scale experiments were conducted to obtain data on the response of reinforced concrete containment walls to impact and penetration by turbine-produced missiles. Missile velocity was varied from 90 to 132 m/s; missile mass, from 1476 to 2100 kg; missile attitude, to the two extremes of piercing and blunt; and panel linear thickness, from 0 (no liner) to 9.5 mm thickness. Penetration depths into the 1.37 m thick panels ranged from 33 cm for the blunt impact of the 1476 kg missile at 92 m/s to 65 cm for the piercing impact of the 2100 kg missile at 115 m/s. The strongest correlation for penetration was with kinetic energy. With the linear absent much superficial cracking was present on the rear face, while the liner seemed to inhibit such cracking. Impact with a sharp missile attitude caused more severe backface cracking than with the blunt attitude. Intensity of shear plug cracking correlated strongly with missile momentum for the same missile attitude. Rear face kinematic quantities showed displacements in excess of 6 cm and velocities in excess of 7 m/s. DOE

N82-10443# Sandia Labs., Albuquerque, N. Mex.
NUMERICAL MODELING OF OBLIQUE HYPERVELOCITY IMPACT USING TWO DIMENSIONAL PLANE STRAIN MODELS
William T. Brown 1981 5 p refs Presented at the APS Conf. on Shock Waves in Condensed Matter, Menlo Park, Calif., 23 Jun. 1981
(Contract DE-AC04-76DP-00789)
(DE81-024077; SAND-80-2865C; CONF-810684-12) Avail: NTIS HC A02/MF A01

A numerical procedure was developed to obtain information on the hypervelocity impact of a sphere onto a plate by considering the corresponding plane strain problem. A rod is presented as a superposition of an infinite chain of spheres and the information about a single sphere is numerically unfolded. The technique is used to calculate the peak pressure distribution when the impact is normal to the plate surface. DOE

N82-10444# Washington State Univ., Pullman. Dept. of Physics.
FRACTO-EMISSION ACCOMPANYING ADHESIVE FAILURE
J. T. Dickinson, M. K. Park, E. E. Donaldson, and L. C. Jensen Sep. 1981 24 p refs Submitted for publication
(Contract N00014-80-C-0213; NR Proj. 092-358)
(AD-A104050; TR-2) Avail: NTIS HC A02/MF A01 CSCL 20/11

For a wide range of materials, emission of electrons (EE), positive ions (PIE), and photons (phE) is observed accompanying fracture. Here we report on work concerning emission from adhesive failure. The systems studied include interfacial failure between epoxy--brittle materials, polybutadiene-glass, and pressure sensitive adhesives--polymers. When interfacial failure occurs, it produces highly excited surfaces with intense charge separation. De-excitation in the presence of surface charge produces intense, long lasting (several minutes) emission. Energy distribution curves for both EE and PIE decrease monotonically with a tail extending out to several hundred eV. For a few systems we compare EE and phE which show different decay characteristics. Author (GRA)

N82-10445# Research Inst. of National Defence, Stockholm (Sweden) Huvudavdelning 2.
TESTING PLASTER SHEET WALLS ON A STEEL PLATE FRAMEWORK UNDER THE EFFECT OF SHOCK WAVES IN THE AIR [FOERSOEK MED LUFTSTOETVAAGSBELASTADE GIPSSKIVEVAAGGAR PAA STAALREGELSTOMME]
Jan-Erik Jonasson Oct. 1980 195 p refs In SWEDISH
(FOA-C-20372-D4(A3)) Avail: NTIS HC A09/MF A01

Walls were built up with one or two 13 mm thick plaster sheets on each side of a 1200 x 2300 mm framework. During the 16 tests pressure in front and behind the wall; the bending of the construction and cracks in the plaster, and other permanent distortions were recorded. An analog method is proposed, giving the effects of an explosion wave by means of static tests with hydraulically regulated loads. In addition, real explosions with eight kg explosives were carried out on the ground and above the ground, at distances of five to eleven m from the wall. The transfer of the load to the framework can be improved by crossrods or by gluing a glass fiber fabric onto the plaster sheets. The

agreement between theory and practice is satisfactory.
Author (ESA)

N82-10446# Research Inst. of National Defence, Stockholm (Sweden). Huvudavdelning 2.
DEFORMATION, SPEED AND ACCELERATION OF PLASTIC SYSTEMS EXPOSED TO SHOCK WAVE LOADS IN THE AIR [DEFORMATION, HASTIGHET OCH ACCELERATION FOER PLASTISKA SYSTEM UTSATTA FOER LUFTSTOETVAAGSBELASTNING]
Jan-Erik Jonasson Oct. 1980 48 p refs In SWEDISH
(FOA-C-20373-D4(A3)) Avail: NTIS HC A03/MF A01

Complete analytical expressions are presented for a system with one degree of freedom whose inner resistance is assumed to be constant during the distortion. A base for a dynamic calculation of the first distortion process, with the aid of a minicomputer is given. Arbitrarily chosen load data can be translated into a simplified load-time-scheme which includes the case of a pure impulse load and long lasting pressure effects. A calculation of the maxima deformation for different load functions, in size and time is reported for the case of the plate simply fastened along two opposite sides, and for the case of a plate fastened along the four sides. In this analysis, the real system is translated to an equivalent one degree of freedom system.
Author (ESA)

N82-10447# Karlsruhe Univ. (West Germany). Inst. fuer Werkstoffkunde 2.
HIGH TEMPERATURE PROPERTIES OF Si3N4. CREEP OF REACTION BONDED SILICON NITRIDE Final Report
Georg Grathwohl, Franz Porz, and Fritz Thuemmler Bonn Bundesministerium fuer Forschung und Technologie Dec. 1980 36 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-80-128; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 7,60

The correlation between microstructure and creep behavior was investigated. Internal oxidation during creep testing in air plays an important role. Materials were developed with a narrow pore size distribution and hence a very limited amount of internal oxidation with creep rates below .000001/hr (at 1300 C and loaded with 70 to 100 MN/sqm). Activation energies between 540 and 700 kJ/mol and stress exponents of $1\text{-}2 < n < 2\text{-}3$ are found.
Author (ESA)

N82-10443# Danish Research Center for Applied Electronics, Hoersholm. Dept. for Mechanical Testing.
APPLICATIONS OF MECHANICAL SHOCK SPECTRA. APPLICATION OF SHOCK SPECTRA IN SHOCK-TESTING AND MECHANICAL DESIGN OF ELECTRONIC EQUIPMENT AS WELL AS DESCRIPTION OF ENVIRONMENTS
Bjoern Barueel Petersen Jan. 1981 68 p refs Sponsored by Danish Council of Technology
(ECR-106) Avail: NTIS HC A04/MF A01

The relationship between shock environment, shock test specification, and shock design of equipment is treated in terms of shock spectra. Those shock characteristics which are important in causing damage to structures are emphasized. Shock testing by classical (half sine) shock impulses is compared with vibrator testing with shock-spectrum-specified oscillating shock transients. Potentials and limitations of shock spectra are discussed and environmental shock measurements are presented together with their computed spectra.
Author (ESA)

N82-10449# British Gas Corp., Newcastle-upon-Tyne (England). Engineering Research Station.
MAGNETIC CRACK DETECTION OFFSHORE: THE WAY TO GO IN THE FUTURE
M. J. King (Star Offshore Services Ltd.) and R. F. Lumb Apr. 1980 19 p ref Submitted for publication
(ERS-E-246) Avail: NTIS HC A02/MF A01

The basic requirements for magnetic flux in magnetic crack detection are explained. A system for obtaining the magnetic flux from electrical conductors placed on, but insulated from, a structure is described and its application to complex welds, such as nodes, in offshore structures, is discussed. Its technical advantages, compared with permanent magnets, and current flow from prods, are explained. Diving time is reduced and the test can be done by one technician/diver instead of two. The sanctioning of lower flux levels is proposed. The development of equipment for optimizing the performance of the parallel conductor and encirclement coil system for use underwater is described. Experience in applying the technology offshore is detailed.
Author (ESA)

N82-10450# British Gas Corp., Newcastle-upon-Tyne (England). Engineering Research Station.
TOUGHNESS SPECIFICATION FOR SHEAR FRACTURE ARREST IN PIPELINES
G. D. Fearnehough and D. G. Jones Jun. 1980 21 p refs Presented at Intern. Conf. on Fracture Mech., Rome, 24-27 Jun. 1980
(ERS-E-262) Avail: NTIS HC A02/MF A01

Up-to-date information from a wide range of full scale shear fracture propagation tests on linepipe was reviewed and statistically analyzed, showing that it is consistent with a previously published theory. Effects on recently studied materials (materials showing separations, high toughness steels, and thick walled pipe), not previously accounted for by this theory, are considered, and a method for incorporating them into the theory is shown. A nomograph is presented which gives Charpy predictions for fracture arrest.
Author (ESA)

N82-10451# Fraunhofer-Inst. fuer Betriebsfestigkeit, Darmstadt (West Germany).
THE INFLUENCE OF COMPONENT SIZE, TYPE OF LOADING SEQUENCE AND LOAD LEVEL ON THE FATIGUE IMPROVEMENT BY COLD WORKING OF HOLES
H. Lowak 1981 127 p refs In GERMAN; ENGLISH summary
(LBF-FB-157-1981) Avail: NTIS HC A07/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 95

Fatigue tests were carried out, using open hole specimens (Kt = 2.5) with and without stress coining. The compressive residual stresses in the holes were induced by mandrelizing. Two materials, four specimen sizes, three types of loading sequences (constant amplitude, miniTWIST and a Gaussian random sequence) and two load levels were investigated. For each specimen the fatigue life to crack initiation as well as to total fracture was recorded. The residual stresses induced by the loading sequence and by the cold working process were experimentally and theoretically determined.
Author (ESA)

N82-10452# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Inst. fuer Aeroelastic.
CALCULATION OF NATURAL MODES OF VIBRATION FOR ROTOR BLADES BY THE FINITE ELEMENT METHOD
Fritz Kiessling and Dieter Ludwig Jan. 1981 66 p refs In GERMAN; ENGLISH summary
(DFVLR-FB-81-07) Avail: NTIS HC A04/MF A01; DFVLR, Cologne DM 14,20

The mass and stiffness matrices for a rotating blade are established by the finite element method. The formulation is based on the Lagrange function presented for combined flapwise bending, chordwise bending, and torsion of twisted nonuniform rotor blades. The element matrices were created by the nonnumeric computer program REDUCE by which it is possible to evaluate the formulas by symbolic manipulation. An ordering scheme was introduced to demonstrate which terms were simplified or neglected. As examples, eigenanalyses are performed for a nonrotating homogeneous beam and for the rotor blade of a wind energy converter.
Author (ESA)

N82-10453# European Space Agency, Paris (France).
EXPERIMENTS WITH THIN-WALLED, ISOTROPIC CONES SUBJECTED TO AXIAL LOAD, AXIAL LOAD COMBINED WITH CONSTANT INTERNAL PRESSURE AND EXTERNAL HYDROSTATIC PRESSURE
Ulrich Heidmann Apr. 1981 33 p refs Transl. into ENGLISH of "Versuche mit duennwandigen isotropen Kegelstuempfen unter Axiallast, konstantem Innendruck mit Axiallast u. unter allseitigem Aussendruck" Rept. DFVLR-Mitt-80-02 DFVLR, Brunswick, Dec. 1979 Original report in GERMAN previously announced as N81-14348

(ESA-TT-670; DFVLR-Mitt-80-02) Avail: NTIS HC A03/MF A01

The buckling and post-buckling loads of thin-walled (Mylar film), isotropic cones were determined theoretically and experimentally. The experimental results are compared with calculated buckling loads for an ideal cone with the boundary conditions employed in the test. Author (ESA)

N82-10454# Dow Chemical Co., Midland, Mich. Highway and Concrete Products Research and Development.

DEVELOPMENT AND EVALUATION OF POLYMER MODIFIED PORTLAND CEMENT CONCRETE LAGGING FOR MINE OPENINGS Final Open File Report, 17 Jun. 1976 - 31 Dec. 1978

R. Douglas Eash and Henry W. Kirchner 1 Oct. 1980 127 p (Contract DI-BM-H0262046)

(PB81-223331; BM-OFR-93-81) Avail: NTIS HC A07/MF A01 CSCL 08I

A Saran latex modified portland cement concrete lagging, to be used as a replacement for wood lagging in underground mining was investigated. Two hundred and twenty latex modified concrete lagging were produced for installation in mine at the 17th level. The lagging concept replaces wood systems by using reinforced latex concrete which outperforms and outlives wood systems. It is more cost effective, and is completely nonflammable. GRA

N82-10455# Massachusetts Inst. of Tech., Cambridge. Sea Grant College Program.

GEOTECHNICAL RELIABILITY OF OFFSHORE GRAVITY PLATFORMS

Gregory B. Baecher, Mark Chan, Thomas S. Ingra, Thomas Lee, and Louis R. Nucci Dec. 1980 298 p refs (Grant NOAA-04-7-158-44079)

(PB81-224438; MITSG-80-20; NOAA-81042708) Avail: NTIS HC A13/MF A01 CSCL 13J

The sources of geotechnical uncertainty in offshore structures, and formal methods in geotechnical reliability analysis are presented. The basic uncertain variables, dealing with environmental loads and load effects, and site characterization and parameter estimates are examined. The problem of modeling foundation performance are discussed. The aggregation of these uncertainties into overall estimates of risk and reliability are considered. GRA

N82-10456# National Bureau of Standards, Washington, D.C. Electron Devices Div.

MICROELECTRONIC TEST PATTERNS NBS-12 AND NBS-24

G. P. Carver, R. L. Mattis, and M. G. Buehler May 1981 41 p refs

(PB81-214892; NBSIR-81-2234) Avail: NTIS HC A03/MF A01 CSCL 14B

Microelectronic test patterns NBS-12 and NBS-24 which are modular developmental patterns for experimentally evaluation improved designs of certain test structures were examined. The NBS-12 addresses geometric design considerations for the cross bridge sheet resistor test structure. NBS-24 contains a variety of preliminary designs for the integrated gated-diode electrometer and a series of variations on the design of the MOSFET dc profiler. Both patterns include assorted process parameter test structures. Tables of design parameters, functional descriptions of the test structures in each pattern, and computer composed outline drawings showing all of the test structures are included. GRA

N82-10457# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).

NON-LINEAR AEROELASTIC ANALYSES AND TESTING

Jul. 1981 43 p refs Partly in ENGLISH; partly in FRENCH Meeting held in Cesme, Turkey, 5-10 Apr. 1981

(AGARD-R-698) Avail: NTIS HC A03/MF A01

The ground vibration testing of aircraft with active control systems is discussed and a method of performing and interpreting dynamic tests on non-linear systems, such as control surface actuators is presented. For individual titles, see N82-10458 through N82-10459.

N82-10458# Office National d'Etudes et de Recherches Aeronautiques, Paris (France).

IDENTIFICATION OF THE EIGEN MODES OF A STRUCTURE FROM THE RESPONSES TO A NON-APPROPRIATED EXCITATION

Rolland Dat and Philippe Dunoyer *In* AGARD Non-linear Aeroelastic Analyses and Testing Jul. 1981 18 p refs In FRENCH; ENGLISH summary (For primary document see N82-10457 01-39)

Avail: NTIS HC A03/MF A01

The two methods are presented which use the harmonic responses, at a large number of points on the structure, in order to determine the eigen modes, without necessitating an appropriation of the excitation forces. The first one of the methods, which is more synthetic, determines the set of modal characteristics through the resolution of a set of algebraic equations; the second one, which is more analytic, proceeds to a separation of each mode by combining the harmonic responses of the different points of the structure. The results show that the two methods give a satisfactory modelisation of the structure through the modal representation. Author

N82-10459# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Inst. of Aeroelasticity.

NONLINEAR AEROELASTIC ANALYSES TAKING INTO ACCOUNT ACTIVE CONTROL SYSTEMS

R. Freymann *In* AGARD Non-linear Aeroelastic Analyses and Testing Jul. 1981 19 p refs (For primary document see N82-10457 01-39)

Avail: NTIS HC A03/MF A01

Analytical investigations on aircraft with active control systems can be performed on the basis of an extended formulation of the generalized aeroelastic equations. The structural modal parameters needed for the investigation can be determined in a ground vibration test on the real aircraft structure. A method is presented for determining the transfer functions of the different elements of the control loops in a ground vibration test on the real aircraft and in special tests on the aircraft hydraulic actuation systems. To demonstrate the validity of the procedure, dynamic response calculations based upon the proposed extended formulation of the aeroelastic equations, which take into account both the results of the ground vibration test as well as of the actuator tests, are performed on a model wing structure with a hydraulically driven rudder. Results of the analysis are compared to measured data on the same model structure. A.R.H.

N82-10993# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

A METHOD OF EVALUATION OF THE TORSIONAL RIGIDITY AND THE THIRD STRESS INTENSITY FACTOR OF PRISMATICAL BAR OF RECTANGULAR CROSS SECTION WITH CRACKS

Chen Yizhou *In its* Recent Selected Papers of NW Polytech. Univ., pt. 1 (FTD-ID(RS)T-0259-81-Pt-1) 20 Aug. 1981 p 315-337 refs Transl. into ENGLISH from Recent Selected Papers of NW Polytech. Univ., pt. 1 (Xian Shaanxi), 1979 (For primary document see N82-10980 01-99)

Avail: NTIS HC A17/MF A01

N82-10995# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

STRUCTURAL ANALYSIS OF FUSELAGES WITH CUTOUTS BY FINITE ELEMENT METHOD

G. Shoulian, Sun Can, Tang Xuunchun, and Ye Tiangi *In its* Recent Selected Papers of NW Polytech. Univ., pt. 1 (FTD-ID(RS) T-0259-81-Pt-1) 20 Aug. 1981 p 359-378 refs Transl. into ENGLISH from Recent Selected Papers of NW Polytech. Univ., pt. 1 (Xian Shaanxi), 1979 (For primary document see N82-10980 01-99)

Avail: NTIS HC A17/MF A01

N82-10997# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

DUAL PROPERTIES OF ELASTIC STRUCTURES

Chen Baiping *In its* Recent Selected Papers of NW Polytech. Univ., pt. 2 (FTD-ID(RS)T-0260-81-Pt-2) 28 Aug. 1981 p 1-75 refs Transl. into ENGLISH from Recent Selected Papers of NW

Polytech. Univ., pt. 2 (Xian Shaanxi), 1979 (For primary document see N82-10996 01-99)
Avail: NTIS HC A18/MF A01

N82-10999# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ON A METHOD FOR THE DETERMINATION OF PLANE STRESS FRACTURE TOUGHNESS K SUB c OF 30 CrMnSiNi2A STEEL AND SOME RELATED PROBLEMS
Cui Zhenyuan, Zheng Changqing, Shi Jize et al *In its* Recent Selected Papers of NW Polytech. Univ., pt. 2 (FTD-ID(RS)T-0260-81-Pt-2) 28 Aug. 1981 p 112-136 refs Transl. into ENGLISH from Recent Selected Papers of NW Polytech. Univ., pt. 2 (Xian Shaanxi), 1979 (For primary document see N82-10996 01-99)
Avail: NTIS HC A18/MF A01

42 GEOSCIENCES (GENERAL)

N82-10460# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
MAGNETOSPHERIC AND GEOMAGNETIC ACTIVITY DURING THE FIRST YEAR (1979) OF THE SCATHA (P78-2) SATELLITE OPERATION Final Report, 1 Oct. 1979 - 30 Sep. 1980
Ching-I. Meng Dec. 1980 397 p
(Contract MIPR-FY7121-80-00009; AF Proj. 7661)
(AD-A104109; AFGL-TR-81-0104) Avail: NTIS HC A17/MF A01 CSCL 08/14

This report consists of two parts. The first is a comprehensive analysis of the geomagnetic field variations observed by several networks of ground-based stations to monitor the magnetospheric conditions during the first year of the SCATHA satellite operation in 1979, together with the determination of the most disturbed and quietest days during the 1979 period. The second part is a summary of the scientific results in the investigation of polar region electron precipitations based on USAF DMSP observations. The daily graphs and listing of 1.0 minute auroral electrojet activity index (AE) constructed from three networks of the magnetic field observations over the Northern American Continent are illustrated as Appendices 2 and 3, respectively.
Author (GRA)

N82-10461# National Oceanic and Atmospheric Administration, Seattle, Wash.
CTD/02 MEASUREMENTS DURING THE EQUATORIAL PACIFIC OCEAN CLIMATE STUDY (EPOCS) IN 1979
L. J. Mangum, N. N. Soreide, B. D. Davies, B. D. Spell, and S. P. Hayes Oct. 1980 641 p refs
(PB81-211203; NOAA-DR-ERL-PMEL-1; NOAA-81041501)
Avail: NTIS HC A99/MF A01 CSCL 08I

Neil Brown instrument System (NBIS) CTD/02 measurements recorded on five cruises are summarized. A description of the acquisition and processing systems and calibration techniques are presented. These data were collected along longitudes of 105 W and 110 W between 15 N and 5 S. Additional casts in the vicinity of 0 degrees, 153 W also presented. Station locations, meteorological conditions, and profiles of temperature, salinity, sigma T, and oxygen are shown for each cast. GRA

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography*.

N82-10462 Clark Univ., Worcester, Mass.
MOVEMENT OF BED MATERIAL IN A SMALL REACH OF A PERENNIAL STREAM Ph.D. Thesis
Abraham Zahavi 1981 181 p
Avail: Univ. Microfilms Order No. 8118828

The relations between a particle's physical properties, its movement and stream channel macro and micro morphology were established and the spatial aspect of bedload movement was studied. Bedload discharge calculations were developed based on the movement of individual particles. Mutual relations between bed material and bedload movement were explored. It was found that different flow magnitudes, in relation to bedload movement, likely explain the polimodal bed-material size distribution. The fall and winter flows, which are of a higher magnitude create the modal class in the coarse fractions. The late spring and summer flows which are of a lower magnitude, transport only fine bed-material and create the modal class in finer fractions. It was also found that where large boulders are not an integral part of the bed-material, bedload grain size distribution coarsens as a function of time during the fall and winter flow events. This sequential coarsening of bedload is explained by removal of finer material by early season flows.
Dissert. Abstr.

N82-10463 Idaho Univ., Moscow.
FORECASTING SUBSURFACE WATER FLOW AND STORAGE ON FORESTED SLOPES USING A FINITE ELEMENT MODEL Ph.D. Thesis
Mohsen Mohsenisaravi 1981 176 p
Avail: Univ. Microfilms Order No. 8119892

Subsurface flow in a three soil layer vertical cross section of the Pine Creek watersheds in the Idaho Batholith of central Idaho was simulated using the finite element model, UNSAT2, under uncut, clearcut, and wildlife conditions. The model was based on a two-dimensional transient saturated-unsaturated analysis of the subsurface flow at the field site. The sensitivity of subsurface outflow to various input parameters indicates that subsurface outflow is most sensitive to the magnitude of saturated hydraulic conductivity. The simulations show that different snowmelt events require different saturated hydraulic conductivity to simulate subsurface outflow adequately. Nomographs were made showing the changes of saturated hydraulic conductivities on control and treated watersheds under harvesting and burning situations.
Dissert. Abstr.

N82-10464 Duke Univ., Durham, N. C.
STRATIFICATION AND MIXING IN SHALLOW TROPICAL AFRICAN LAKES. Ph.D. Thesis
Sally MacIntyre 1981 356 p
Avail: Univ. Microfilms Order No. 8119639

Measurements of current speeds and temperature profiles were used to characterize daily mixing events in three shallow African lakes of differing morphology and exposure to wind. Reasons for the persistence of chemical stratification were explored in a sheltered crater lake. Flow measurements under the aquatic fern Salvinia molesta were the first to confirm that flow within weed beds is not turbulent. Measurements within meromictic Lake Sonachi indicated that monimolimmia are not stagnant. The current measurements were made on spatial and temporal scales appropriate for documenting vertical mixing events on scales relevant to phytoplankton. In Lake Nakuru the upper mixed layer was shallow in the morning but deepened each afternoon despite the strong thermal stratification at its base. Deep mixing events during the day were typical in Lake Sonachi despite the high eddy transfer coefficients for a lake of its small size and high thermal stability. At night wind speeds tended to be low, and deep mixing was infrequent despite the presence of an unstable temperature gradient. Dissert. Abstr.

N82-10465 Utah Univ., Salt Lake City.
MORPHOSTRUCTURAL ANALYSES OF SPACE IMAGERY IN THE CENTRAL COLORADO PLATEAU Ph.D. Thesis
Abdelrahman Mohammad Shafik Maarouf 1981 130 p
Avail: Univ. Microfilms Order No. 8118146

Coincidences of increase or decrease in frequency of most of the lineament trends common to both Skylab and Landsat photos and images of the Colorado Plateau suggest that the peaks or troughs are not artificially introduced by sampling bias, and there are actual preferred orientations represented by peak or trough coincidences. Interpretation of lineaments from Skylab and Landsat data, along with study of magnetic and gravity maps, suggest strong correlation between lineaments and faults in the Precambrian basement. It is shown that the basement

faults influenced the present surface drainage and structures through a sedimentary cover of more than 6 km. The faults were formed during the middle Precambrian, and were rejuvenated later in varying degrees and at various times. Dissert. Abstr.

N82-10466* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
MATE VAN: MOBILE ANALYSIS AND TRAINING EXTENSION
[1981] 7 p
(NASA-TM-84056) Avail: NASA Scientific and Technical Information Facility, P. O. Box 8757, B.W.I. Airport, Md. 21240 CSCL 05B

A modified 30-foot motor coach was equipped with modern data processing equipment in order to train personnel and demonstrate useful techniques and capabilities for analyzing and applying LANDSAT imagery in the western regional area. A block diagram of the interactive digital image manipulation system is presented and its processing features itemized. Specifications for the van and the equipment are listed. False color composites used to interpret and identify many LANDSAT technological applications are included. A.R.H.

N82-10467 Danish Meteorological Inst., Copenhagen.
THE ICE-CONDITIONS IN THE GREENLAND WATERS, 1965. COASTAL MAPS
1980 66 p refs
(ISBN-87-7478-183-9) Avail: NTIS HC A04/MF A01

Maps indicating the size, distribution, and character of Greenland's coastal ice formations are presented. Data is derived from visual flight observations and supplemented by aerial radar reconnaissance and ship observations. Narrative evaluations of ice conditions for several coastal locations are presented. R.J.F.

N82-10468*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MAGSAT: VECTOR MAGNETOMETER ABSOLUTE SENSOR ALIGNMENT DETERMINATION
M. H. Acuna Sep. 1981 39 p refs
(NASA-TM-79648) Avail: NTIS HC A03/MF A01 CSCL 14B

A procedure is described for accurately determining the absolute alignment of the magnetic axes of a triaxial magnetometer sensor with respect to an external, fixed, reference coordinate system. The method does not require that the magnetic field vector orientation, as generated by a triaxial calibration coil system, be known to better than a few degrees from its true position, and minimizes the number of positions through which a sensor assembly must be rotated to obtain a solution. Computer simulations show that accuracies of better than 0.4 seconds of arc can be achieved under typical test conditions associated with existing magnetic test facilities. The basic approach is similar in nature to that presented by McPherron and Snare (1978) except that only three sensor positions are required and the system of equations to be solved is considerably simplified. Applications of the method to the case of the MAGSAT Vector Magnetometer are presented and the problems encountered discussed. A.R.H.

N82-10469*# Martin Marietta Corp., Denver, Colo.
ONBOARD UTILIZATION OF GROUND CONTROL POINTS FOR IMAGE CORRECTION. VOLUME 1: EXECUTIVE SUMMARY Final Report
May 1981 30 p refs 4 Vol.
(Contract NAS5-26094)
(NASA-CR-166731; MCR-81-576-Vol-1) Avail: NTIS HC A03/MF A01 CSCL 05B

Operation of a navigation system, centered around image correction, was simulated and the system performance was analyzed. Onboard utilization of ground control points for image correction is summarized. Simulation results, and recommendations for future mission requirements are presented. E.A.K.

N82-10470*# Martin Marietta Corp., Denver, Colo.
ONBOARD UTILIZATION OF GROUND CONTROL POINTS FOR IMAGE CORRECTION. VOLUME 2: ANALYSIS AND SIMULATION RESULTS Final Report
May 1981 183 p refs 4 Vol.
(Contract NAS5-26094)
(NASA-CR-166732; MCR-81-576-Vol-2) Avail: NTIS HC A09/MF A01 CSCL 05B

An approach to remote sensing that meets future mission requirements was investigated. The deterministic acquisition of data and the rapid correction of data for radiometric effects and image distortions are the most critical limitations of remote sensing. The following topics are discussed: onboard image correction systems, GCP navigation system simulation, GCP analysis, and image correction analysis measurement. E.A.K.

N82-10471*# Martin Marietta Corp., Denver, Colo.
ONBOARD UTILIZATION OF GROUND CONTROL POINTS FOR IMAGE CORRECTION. VOLUME 3: GROUND CONTROL POINT SIMULATION SOFTWARE DESIGN Final Report
May 1981 409 p refs 4 Vol.
(Contract NAS5-26094)
(NASA-CR-166733; MCR-81-576-Vol-3) Avail: NTIS HC A18/MF A01 CSCL 05B

The software developed to simulate the ground control point navigation system is described. The Ground Control Point Simulation Program (GCPSIM) is designed as an analysis tool to predict the performance of the navigation system. The system consists of two star trackers, a global positioning system receiver, a gyro package, and a landmark tracker. E.A.K.

N82-10472*# Martin Marietta Corp., Denver, Colo.
ONBOARD UTILIZATION OF GROUND CONTROL POINTS FOR IMAGE CORRECTION. VOLUME 4: CORRELATION ANALYSIS SOFTWARE DESIGN Final Report
May 1981 86 p refs 4 Vol.
(Contract NAS5-26094)
(NASA-CR-166734; MCR-81-576-Vol-4) Avail: NTIS HC A05/MF A01 CSCL 05B

The software utilized for image correction accuracy measurement is described. The correlation analysis program is written to allow the user various tools to analyze different correlation algorithms. The algorithms were tested using LANDSAT imagery in two different spectral bands. Three classification algorithms are implemented. E.A.K.

N82-10473# Nova Univ., Dania, Fla.
SEASAT ALTIMETRY ADJUSTMENT MODEL INCLUDING TIDAL AND OTHER SEA SURFACE EFFECTS
Georges Blaha Hanscom AFB, Mass. AFGL Mar. 1981 113 p refs
(Contract F19628-78-C-0013; AF Proj. 2309)
(AD-A104188; SR-3; AFGL-TR-81-0152) Avail: NTIS HC A06/MF A01 CSCL 22/2

This study is a part of the on-going effort aimed at improved determinations of the Earth's gravity field through the adjustment of satellite altimeter data in the short-arc mode. Until recently the key role in such adjustments has been played by GEOS-3 altimeter data. However, Seasat altimetry is envisioned as providing a more accurate means for addressing this task. In view of the improved quality of altimeter data and of the corresponding more stringent requirements for the data reduction, several improvements in the existing altimetry model have been designed and are described herein. For example, the criteria have been established specifying the maximum and the mimimum allowable lengths of Seasat arcs. An important improvement in the economy has been achieved through a reduction in the number of spherical-harmonic potential coefficients entering the orbital integrator, without a noticeable compromise in the excellent quality of the Seasat observational system. GRA

N82-10474# Department of Energy, Washington, D. C. Energy Information Administration.
VENEZUELA, TRINIDAD AND TOBAGO: CRUDE OIL POTENTIAL FROM KNOWN DEPOSITS
William D. Dietzman, Naim R. Rafidi, and Arthur J. Warner Jul. 1981 127 p refs
(DE81-027023; DOE/EIA-0297) Avail: NTIS HC A07/MF A01

Estimates of original oil in place: ultimate recovery; remaining reserves; and projected supply patterns are presented. A discussion of the methodology for projecting supply patterns is

also presented. The Republic of Venezuela ranked 7th in 1979 in production among the oil producers of the world and is one of the leading exporters of crude oil. About 1/3 of the country's exports are received by the United States, and it was the 5th and 3rd largest supplier of crude oil and refined products to the United States in 1978 and 1979, respectively. DOE

N82-10475# Nevada Univ., Reno.
LOW-TO-MODERATE TEMPERATURE GEOTHERMAL RESOURCE ASSESSMENT FOR NEVADA, AREA SPECIFIC STUDIES Final Report, 1 Jun. 1980 - 30 Aug. 1981
D. T. Trexler, B. A. Koenig, T. Flynn, J. L. Bruce, and G. Ghusn, Jr. 1981 223 p refs
(Contract DE-AC08-79NV-10039)
(DE81-030487; DOE/NV-10039/3) Avail: NTIS HC A10/MF A01

The Hawthorne study area encompasses approximately 310 sq km. The energy needs of the military and the local population are substantial. The techniques employed in the resource assessment are described. Geological and geophysical methods were used and the results are reported. T.M.

N82-10476# Bendix Field Engineering Corp., Grand Junction, Colo.
STATISTICAL TECHNIQUES APPLIED TO AERIAL RADIOMETRIC SURVEYS (STAARS): SERIES INTRODUCTION AND THE PRINCIPAL-COMPONENTS-ANALYSIS METHOD
Fredric L. Pirkle Apr. 1981 62 p refs
(Contract DE-AC13-76GJ-01664)
(DE81-029177; GJBX-114(81)) Avail: NTIS HC A05/MF A01

A series of open-file reports established to provide the latest interpretation techniques to those using aerial radiometric data is announced. Geological applications of the technique are emphasized in case histories. A bibliography is provided which defines the detailed theory and statistics of the technique to assist researchers in ascertaining the statistical validity and merit of the technique. The use of multivariate statistical analysis in delineating regions favorable to uranium deposition in the Lubbock and Plainview quadrangles of Texas, and along the Texas Gulf coast is demonstrated in this issue. GRA

N82-10477# Texas Univ., Austin. Dept. of Petroleum Engineering.
TERTIARY OIL RECOVERY PROCESSES RESEARCH AT THE UNIVERSITY OF TEXAS Final Report, Oct. 1979 - Sep. 1980
R. S. Schechter and W. H. Wade Jun. 1981 135 p refs
(Contract DE-AC19-78BC-20001)
(DE81-025222; DOE/BC-20001/10) Avail: NTIS HC A07/MF A01

Surfactant adsorption, phase behavior, interfacial tension, and solubilization were examined. Focus is on solubilization, I.F.T., and phase behavior with the emphasis on the influence of branching for anionics and molecular weight for nonionics. Phase behavior is related to emulsion stability, polymeric surfactants, and salinity tolerant surfactants were evaluated. DOE

N82-10478# Oak Ridge National Lab., Tenn.
ION EXCHANGE CHARACTERISTICS OF ENHANCED OIL RECOVERY SYSTEMS (MISCIBILITY STUDIES) Semiannual Report, 1 Apr. 1979 - 30 Sep. 1980
P. C. Ho, K. A. Kraus, T. M. Bender, and S. B. Ogden Jul. 1981 59 p refs
(Contract W-7405-eng-26)
(DE81-769734; DOE/BETC/OR-19) Avail: NTIS HC A04/MF A01

During the report period: (1) studies of the hydrotropic properties of organic alkylbenzenesulfonates and particularly of alkylbenzenecarboxylates were extended; (2) the effects of several different alcohols on miscibility between aqueous protosurfactant solutions and aliphatic and aromatic alkanes were investigated; (3) hydrotropic properties of an alicylic carboxylate were determined; (4) the equivalent weight of the organic salts studied was extended into the surfactant range; (5) solubilities of protosurfactants and surfactants in salt solution were measured; and (6) investigations of the adsorption of protosurfactants on minerals as a function of salinity were started. Measurements include establishment of the phase behavior in the limiting three-component systems, the effect of protosurfactant concentration in the four-component systems, and determination of the compositions in a limited number of cases of the coexisting phases. DOE

N82-10479# Argonne National Lab., Ill. Land Reclamation Program.
FRACTURE FLOW OF GROUNDWATER IN COAL-BEARING STRATA
Jeffrey P. Schubert 1980 15 p refs Presented at 1980 Symp. on Surface Mining Hydro., Sedimentology, and Reclamation, Lexington, Ky., 1-5 Dec. 1980
(Contract W-31-109-eng-38)
(DE81-023810; CONF-801263-1) Avail: NTIS HC A02/MF A01

Laboratory tests on core samples of sandstones, siltstones, shales, and claystones indicate extremely low intergranular hydraulic conductivities. Various aquifer tests, using wells in the same locations, invariably showed hydraulic conductivities to be much greater than those estimated by laboratory techniques. In addition the hydraulic conductivity of highly fractured rock can be 100 to 1,000 times greater than slightly fractured rock. The greatest concentration of fractures usually occurs in faulted areas and in narrow fracture zones less than 100 m below ground surface. The majority of large inflows through rock into surface and underground mines occur at the faults and fracture zones. By studying and understanding more about the structural control of fractures in coal basins, the larger inflows possibly could be avoided. DOE

N82-10480# Los Alamos Scientific Lab., N. Mex.
DEVELOPMENT OF MAN-MADE GEOTHERMAL RESERVOIRS
Roland A. Pettitt 1981 9 p Presented at the Energy in the Man-Built Environment: The Next Decade Specialty Conf., Vail, Colo., 3-5 Aug. 1981
(Contract W-7405-eng-36)
(LA-UR-81-852) Avail: NTIS HC A02/MF A01

The technology used to create and extract heat from a geothermal reservoir in low porosity, granitic basement rock in at the Fenton Hill site in northern New Mexico is described. Topics covered include drilling boreholes, injecting potable water as the working fluid, hydraulic fracture to provide the large surface area need for heat exchange, the mechanics of reservoir growth, make-up water requirements, geofluid chemistry, electrical generation, operational constraints, and effects on the environment. A.R.H.

N82-10481# Research Inst. of National Defence, Linkoeping (Sweden). Huvudavdelning 3.
USE OF RADAR AND MICROWAVE RADIOMETRY FOR RECONNAISSANCE SATELLITES [ANVAENDNING AV RADAR OCH MIKROVAAGSRADIOMETRIE VID SPANINGSSATELLITER]
Hans Lok Oct. 1980 28 p refs In SWEDISH
(FOA-C-30204-E1) Avail: NTIS HC A03/MF A01

The advantages and disadvantages of side-looking radar and microwave radiometers for observations of Earth by satellite are discussed. Each system is examined with regards to field of view and instrument sensitivity. Microwave attenuation is also discussed. A.R.H.

N82-10482# Bundesanstalt fuer Geowissenschaften und Rohstoffe, Hannover (West Germany).
DEVELOPMENT OF ORGANIC GEOCHEMICAL AND ISOTOPE TECHNIQUES FOR HYDROCARBON EXPLORATION Final Report
Eckhard Faber, Heinz Hufnagel, Helmut Jacob, Joachim Kock, Wolfgang Stahl, Manfred Teschener, and Hermann Wehner Bonn Bundesministerium fuer Forschung und Technologie Oct. 1980 55 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-80-076; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 11,55

Sedimentary organic matters was characterized by correlating microscopic and chemical data. Techniques for oil-oil and

oil-source rock correlations were developed using the distribution of polycyclic aromatic hydrocarbons. It is shown that the carbon isotopic composition of oils, extracts and kerogens. The C12/C13 ratios of methane from different natural gases were correllated with the maturity of their source rocks. The C13/C12 ratios of methane from cuttings were also determined. Results show that pyrolysis chromatograms reflect the type of organic matter. Fluorescence of dinoflagellates is directly related to maturity. Bitumens are classified by fluorescence microscopy. Correlation of crude oils is performed using chromatograms of the aromatic fraction of crudes. Gas-source rock correlation is feasible by a systematic correlation of delta values of methane and the maturity of the source organic matter. Isotope analyses of head-space gases are developed for active exploration.

Author (ESA)

N82-10483# Research Inst. of National Defence, Stockholm (Sweden). Huvudavdelning 2.

GEOGRAPHICAL DATA PROCESSING IN WEST GERMANY [GEOGRAFISK DATABEHANDLING I VAESTTYSKLAND]

Anders Wellving Feb. 1981 34 p refs In SWEDISH (FOA-C-20397-D8(F8)) Avail: NTIS HC A03/MF A01

The use of computer processing of geographic data is described. Important investments were made in equipment and programming for the automatic production of topographic maps, civil and military. A problem is the lack of training facilities for young topographers and geographers who wish to specialize in data processing. Author (ESA)

N82-10484# Kiruna Geophysical Inst. (Sweden).

A SWEDISH PROPOSAL FOR AN EISCAT/GEOS-2 EXPERIMENT

Svante Westerlund, Georg Gustafsson, Aake Steen, John Murdin, Gudmund Wannberg, Rolf Bostroem (Uppasala Ionospheric Obs., Sweden), Aake Hedberg (Uppsala Ionospheric Obs., Sweden), Hermann Opgenoorth (Uppsala Ionospheric Obs., Sweden), Erling Nielsen (Max-Planck Inst. fuer Aeronomie, Katlenburg-Lindau, West Germany), Carl-Gunne Faelthammar (Royal Inst. of Technol., Stockholm) et al Mar. 1981 28 p refs

(KGI-175; ISSN-0347-6405) Avail: NTIS HC A03/MF A01

An experiment that uses GEOS to measure in the equatorial plane at the same time as EISCAT and other ground based instrumentation are monitoring the ionosphere is described. The generation, acceleration and loss of auroral particles are studied. Signatures of particle precipitation in the ionosphere and properties of the plasma and electric field in the equatorial plane are correlated. The position of the conjugate point of GEOS is determined during various conditions. Such data in conjunction with magnetic field models, make it feasible to identify and estimate the various effects that contribute to the field during disturbances, i.e., to improve geomagnetic field models.

Author (ESA)

N82-10485# Technical Research Centre of Finland, Espoo. Maankaeytoen Lab.

SMALL-SCALE TERRAIN MAPPING BASED ON NUMERICAL INTERPRETATION OF LANDSAT IMAGERY [LANDSAT-KUVIEN NUMEERISEEN TULIKINTAAN PERUSTUVA PIENKAAVAINEN MAASTOKARTOITUS]

Esa Franssila 1981 75 p refs In FINNISH; ENGLISH summary Original contains color illustrations

(VTT-40; ISBN-951-38-1180-8; ISSN-0355-3477) Avail: NTIS HC A04/MF A01

The usability of digital LANDSAT imagery for producing terrain data, the general map of Finland (1: 400,000) and other small-scale terrain maps was investigated. The image processing was based on numerical processing of: image correction to map projection; image interpretation; data generalization; and graphic output along with statistical summary data. In order to achieve an automated cartographic generalization, the scale caused details were effaced by applying alternative rules. Compared with the conventional generalization, the result is defective. Figure lines for cartographic presentation were produced. Author (ESA)

N82-10486# Science Research Council, Slough (England).

STUDY ON SATELLITE RADAR ALTIMETRY IN CLIMATOLOGICAL AND OCEANOGRAPHIC RESEARCH, VOLUME 1 Final Report

Paris ESA Dec. 1980 450 p refs Prepared in cooperation with Natural Environment Research Council, Godalming, England 2 Vol.

(Contract ESA-4355/80/F-FC(SC))

(SP/153/06/01/FR(80)-Vol-1; ESA-CR(P)-1437-Vol-1) Avail: NTIS HC A19/MF A01

The contribution of satellite radar altimetry to climate, oceanographic and glaciological research is analyzed. The current position, the need for improved data and the relevance of existing altimeter data to climate, oceanographic and glaciological studies are discussed. Experience gained from previous missions is reviewed and the corrections which need to be made to the basic altimeter data are considered, along with the requirements for supporting measurements needed to aid in interpretation of this data. Sampling requirements in relation to particular aspects of oceanography and glaciology are treated. The role of circulation models in satellite altimetry, and those features of instrument design relating to scientific requirements, are examined. Supporting and complementary instruments are reviewed. The value of multi-satellite missions and possible future developments are discussed. Author (ESA)

N82-10487# Science Research Council, Slough (England).

STUDY ON SATELLITE RADAR ALTIMETRY IN CLIMATOLOGICAL AND OCEANOGRAPHIC RESEARCH, VOLUME 2 Final Report

Paris ESA Dec. 1980 47 p Prepared in cooperation with Natural Environment Research Council, Godalming, England 2 Vol.

(Contract ESA-4355/80/F-FC(SC))

(SP/153/06/01FR(80)-Vol-2; ESA-CR(P)-1437-Vol-2) Avail: NTIS HC A03/MF A01

The potential contribution of satellite radar altimetry to climatology, oceanography, and glaciology is discussed. The altimetry requirements for future programs are considered. Tradeoffs between spatial and temporal coverage, sampling rate and error budget, involved in defining an optimum mission are examined. Accuracy of + or - 10 cm, pulse lengths of 1.5 nsec and integration times of 3 sec are recommended. Orbital inclination should be between 60 and 65 deg. Author (ESA)

N82-10488# University Coll., Dublin (Ireland). Dept. of Physics.

STUDY ON CALIBRATION METHODS FOR EARTH OBSERVATION OPTICAL IMAGING INSTRUMENTS Final Report

E. O. Mongain Paris ESA Nov. 1980 230 p refs

(Contract ESA-4237/80/NL-PP(SC))

(UCD-207/1/80; ESA-CR(P)-1443) Avail: NTIS HC A11/MF A01

The properties and calibration of lamps diffusors, and detectors are considered. Measurements of solar irradiance from ground level are illustrated and the NASA solar spectral irradiance experiments are discussed with respect to the possibility of image striping as an inherent property of imaging arrays. Author (ESA)

N82-10489# Intermountain Forest and Range Experiment Station, Ogden, Utah.

LARGE-SCALE COLOR AERIAL PHOTOGRAPHY AS A TOOL IN SAMPLING FOR MORTALITY RATES

David A. Hamilton, Jr. Jan. 1981 14 p refs Sponsored by USDA Forest Service

(PB81-214777; FSRP/INT-269) Avail: NTIS HC A02/MF A01 CSCL 02F

Mortality rates specify the proportion of trees with a given set of characteristics that are expected to die in a fixed time interval. Results indicate that 1 year mortality trees can be dated and species can be assigned to green trees and to 1 year mortality trees with acceptable accuracy on 70 mm color photography at scales of 1:1600 and 1:2400. GRA

N82-10071*# Scientific Analysts and Consultants, Inc., Rockville, Md.

DISTORTION-FREE MAPPING OF VISSR IMAGERY DATA FROM GEOSYNCHRONOUS SATELLITES

F. K. Chan *In* NASA. Goddard Space Flight Center Sixth Ann. Flight Mech./Estimation Theory Symp. Oct. 1981 35 p ref (For primary document see N82-10064 01-12)

(Contracts NOAA-01-8-MO1-1864; NOAA-NA79-KA-C-00026)
Avail: NTIS HC A13/MF A01 CSCL 22A

N82-10072*# General Electric Co., Lanham, Md. Space Div.
COMPUTATIONAL ASPECTS OF GEOMETRIC CORRECTION DATA GENERATION IN THE LANDSAT-D IMAGERY PROCESSING
I. Levine *In* NASA. Goddard Space Flight Center Sixth Ann. Flight Mech./Estimation Theory Symp. Oct. 1981 16 p ref
(For primary document see N82-10064 01-12)
(Contract NAS5-25300)
Avail: NTIS HC A13/MF A01 CSCL 05B

N82-10073*# General Electric Co., Lanham, Md. Space Div.
THE MSS CONTROL POINT LOCATION ERROR FILTER FOR LANDSAT-D
I. Levine *In* NASA. Goddard Space Flight Center Sixth Ann. Flight Mech./Estimation Theory Symp. Oct. 1981 18 p refs
(For primary document see N82-10064 01-12)
(Contract NAS5-25300)
Avail: NTIS HC A13/MF A01 CSCL 05B

N82-10074*# Naval Electronic Systems Command, Washington, D. C. Electronic Special Warfare and Space Div.
SPIN-AXIS ATTITUDE ESTIMATION AND MAGNETOMETER BIAS DETERMINATION FOR THE AMPTE MISSION
R. H. Thompson, G. F. Neal, and M. D. Shuster *In* NASA. Goddard Space Flight Center Sixth Ann. Flight Mech./Estimation Theory Symp. Oct. 1981 14 p refs Prepared in cooperation with Computer Sciences Corp., Silver Spring, Md. and Business and Technological Systems, Inc., Seabrook, Md. (For primary document see N82-10064 01-12)
Avail: NTIS HC A13/MF A01 CSCL 08B

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N82-10490 Southern Methodist Univ., Dallas, Tex.
THIN-FILM POLYCRYSTALLINE CADMIUM TELLURIDE SOLAR CELLS AND LARGE-AREA POLYCRYSTALLINE SILICON SOLAR CELLS Ph.D. Thesis
Roshdy Abolazayem Abderrassoul 1981 139 p
Avail: Univ. Microfilms Order No. 8117882

Device quality polycrystalline films were deposited on a tungsten-coated graphite substrate by chemical vapor deposition. An in-situ indium layer was deposited prior to CdTe deposition to reduce the back resistance. Indium and iodine were used for n-type doping, and arsenic and phosphorus were used for p-type doping. The structural and electronic properties of the films were evaluated. Post-deposition heat treatment in a cadmium overpressure reduced the electrical resistivity by a factor of 2-3. Large-area purified metallurgical silicon substrates on graphite were prepared by unidirectional solidification. The moving-coil zone-melting technique was used. The pulverized metallurgicalsilicon was acid-treated and phosphoruspentoxide gettered prior to recrystallization, in order to reduce the content of harmful metallic impurities, especially Al and Fe. A spectrophotometric technique was used to determine the iron content in the acid-treated silicon. Dissert. Abstr.

N82-10491 Southern Methodist Univ., Dallas, Tex.
THIN FILM PHOTOVOLTAIC DEVICES Ph.D. Thesis
Ching-Long Lin 1981 117 p
Avail: Univ. Microfilms Order No. 8117881

The deposition of a silicon film containing a p-n junction on a metallurgical silicon substrate was used for the preparation of thin-film silicon solar cells. The substrate was prepared by the unidirectional solidification of the purified metallurgical silicon on a graphite plate, and the silicon film was deposited by the thermal reduction of trichlorosilane with hydrogen containing appropriate dopants. Indium phosphide films were deposited on foreign substrates by the reaction of indium, hydrogen chloride, and phosphine. Their structural and electrical properties were studied. Schottky barriers prepared from indium phosphide films were found to have low rectification ratios, high dark currents, and poor photovoltaic response due to grain boundary effects. The effects of grain boundaries were partially reduced by thermal oxidation, ruthenium (III) treatment, and nitridation, thus improving the photovoltaic characteristics of thin-film indium phosphide solar cells. Dissert. Abstr.

N82-10492 Texas A&M Univ., College Station.
A COMPUTER MODEL OF A STIRLING ENGINE USING A TWO-PHASE TWO-COMPONENT WORKING FLUID Ph.D. Thesis
David Allen Renfroe 1981 193 p
Avail: Univ. Microfilms Order No. 8118295

Stirling engines are potentially the most efficient converters of thermal energy to mechanical work that are manufacturable. In addition to its high efficiency capability, it also operates relatively cleanly, quietly, and with multiple fuel capability. Its one deficiency is the low specific power (power output/engine size.) A method of increasing specific power is described. This is by utilizing a two-phase two-component (TPTC) working fluid or one having a carrier gas and a component which changes phase during the cycle, such as a mixture of water and air. In order to study the effect of adding water to the working fluid of a Stirling engine on its operation, a computer model of the system was developed. The TPTC model is an extension of a Stirling engine with an ideal gas working fluid and includes provisions for accounting for differences in heat transfer and flow losses for a TPTC working fluid. Dissert. Abstr.

N82-10493 Virginia Univ., Charlottesville.
FUNDAMENTAL INVESTIGATIONS ON FUEL CELLS FOR TRANSPORTATION APPLICATIONS Ph.D. Thesis
Earl Jennings Taylor 1981 268 p
Avail: Univ. Microfilms Order No. 8117914

Three areas concerning fuel cells for transportation applications were investigated. The areas are: (1) a comparison of oxygen reduction in phosphoric acid and in trifluoromethanesulfonic acid, (TFMSA); (2) testing of three types of fuel cells under simulated vehicular operating conditions; and (3) the design, fabrication, and testing of a 1/2-kilowatt alkaline fuel cell module. Additions of TFMSA to phosphoric acid enhance the oxygen reduction in phosphoric acid. It is shown that the single cell has no adverse effect on fuel cell performance in simulated automobile power requirements. It is demonstrated that the single cells can be scaled-up without loss of performance. Author

N82-10494 Princeton Univ., N. J.
THE PLASMADYNAMICS AND IONIZATION KINETICS OF THERMIONIC ENERGY CONVERSION Ph.D. Thesis
John Langie Lawless, Jr. 1981 198 p
Avail: Univ. Microfilms Order No. 8118339

Radiation by a Cesium recombination laser operating in a different thermionic converter as an energy efficient process is discussed. To reduce the plasma arc drop, thermionic energy conversion was studied. It is predicted that it is possible to generate the required laser light from a thermionic-type Cesium plasma. A numerical method is developed to solve the thermionic plasma dynamics. The effects of the complete system of electron atom inelastic collisions on the ionization recombination problem are reduced to a simple system one quantum approximation. A Cesium recombination laser is predicted and the magnitudes for the population inversion and the laser efficiency are derived. Thermionic converter performance using laser radiation is considered. It is found that laser radiation impinging on a thermionic plasma enhances the ionization process thereby raising the plasma density and reducing the plasma arc drop.
Dissert. Abstr.

N82-10495*# Gilbert/Commonwealth, Reading, Pa.
MAGNETOHYDRODYNAMICS MHD ENGINEERING TEST

FACILITY ETF 200 MWE POWER PLANT. CONCEPTUAL DESIGN ENGINEERING REPORT CDER. VOLUME 3: COSTS AND SCHEDULES Final Report
Sep. 1981 61 p 5 Vol.
(Contracts DEN3-224; DE-AI01-77ET-10769)
(NASA-CR-165452-Vol-3; DOE/NASA/0224-1-Vol-3) Avail: NTIS HC A04/MF A01 CSCL 10B

The extimated plant capital cost for a coal fired 200 MWE electric generating plant with open cycle magnetohydrodynamics is divided into principal accounts based on Federal Energy Regulatory Commision account structure. Each principal account is defined and its estimated cost subdivided into identifiable and major equipment systems. The cost data sources for compiling the estimates, cost parameters, allotments, assumptions, and contingencies, are discussed. Uncertainties associated with developing the costs are quantified to show the confidence level acquired. Guidelines established in preparing the estimated costs are ihcluded. Based on an overall milestone schedule related to conventional power plant scheduling experience and starting procurement of MHD components during the preliminary design phase there is a 6 1/2-year construction period. The duration of the project from start to commercial operation is 79 months. The engineering phase of the project is 4 1/2 years; the construction duration following the start of the man power block is 37 months. A.R.H.

N82-10496*# National Aeronautics and Space Administration. Pasadena Office, Calif.
SOLAR ENERGY MODULATOR Patent Application
Allan R. McDougal (JPL, California Inst. of Tech., Pasadena) and Robert R. Hale, inventors (to NASA) (JPL, California Inst. of Tech., Pasadena) Filed 17 Jul. 1981 14 p
(Contract NAS7-100)
(NASA-Case-NPO-15388-1; US-Patent-Appl-SN-284286) Avail: NTIS HC A02/MF A01 CSCL 10A

A module is described with a receiver having a solar energy acceptance opening and supported by a mounting ring along the optic axis of a parabolic mirror in coaxial alignment for receiving solar energy from the mirror, and a solar flux modulator plate for varying the quantity of solar energy flux received by the acceptance opening of the module. The modulator plate is characterized by an annular, plate-like body, the internal diameter of which is equal to or slightly greater than the diameter of the solar energy acceptance opening of the receiver. Slave cylinders are connected to the modulator plate for supporting the plate for axial displacement along the axis of the mirror thereby shading the opening with respect to solar energy flux reflected from the surface of the mirror to the solar energy acceptance opening. T.M.

N82-10497*# Mobil Tyco Solar Energy Corp., Waltham, Mass.
LARGE AREA SILICON SHEET BY EFG Quarterly Report, 1 Apr. - 30 Jun. 1981
11 Sep. 1981 50 p ref Sponsored by NASA and DOE Prepared for JPL, Pasadena
(Contract JPL-954355)
(NASA-CR-164881; DOE/JPL-954355-81/18; JPL-9950-591) Avail: NTIS HC A03/MF A01 CSCL 10A

The influence of parameters such as CO2 concentration, gas flow patterns, quartz in the bulk melt, melt doping level and growth speed on ribbon properties was examined for 10 cm wide ribbon. Ribbon quality is optimized for ambient CO2 in argon concentrations in the range from 1000 to 5000 ppm. Cell performance degrades at CO2 concentrations above 5000 ppm and IR interstitial oxygen levels decrease. These experiments were done primarily at a growth speed of 3.5 cm/minute. Cartridge parameters influencing the ribbon thickness were studied and thickness uniformity at 200 micrometers (8 mils) has been improved. Growth stability at the target speed of 4.0 cm/minute was improved significantly. T.M.

N82-10498*# California Inst. of Tech., Pasadena.
DEVELOPMENT AND FABRICATION OF A SOLAR CELL JUNCTION PROCESSING SYSTEM Quarterly Progress Report
Robert Giesling Jul. 1981 30 p ref Sponsored in part by DOE Prepared for JPL, Pasadena
(Contracts NAS7-100; JPL-955640)
(NASA-CR-163768; DOE/JPL-955648-81/6; JPL-9950-585; QPR-6) Avail: NTIS HC A03/MF A01 CSCL 10A

Modifications to the ground plane, to insure a good electrical return path during the pulse discharge, were made using a ring of beryllium copper finger stock attached to the underside of the aluminum ground plate. Experiments on annealing of wafers with ion implantation damage continued. The entire surface of 100 mm diameter wafers were annealed by one pulse for the standard implant (10 keV, phosphorus, 2x10 to the 15th power ions/sq cm). While samples are being fabricated into solar cells for electrical characterization, work is continuing on improvement of the electron beam uniformity and the optimization of the diode parameters. The engineering design was completed and the manufacturing detail drawings were released for fabrication. Assembly of the subcomponents for the exit and entrance locks is almost complete. These components include the cassettes, the indexing mechanisms, main doors, and wafer carrier transfer modules. The 'Y' track and three phase transition track sections are under final assembly and test. J.M.S.

N82-10499*# Ross (Bernd) Associates, San Diego, Calif.
DEVELOPMENT OF AN ALL-METAL THICK FILM COST EFFECTIVE METALLIZATION SYSTEM FOR SOLAR CELLS Quarterly Report, May - Jul. 1980
Bernd Ross Aug. 1980 35 p refs Sponsored in part by DOE Prepared for JPL
(Contract JPL-955688)
(NASA-CR-164779; DOE/JPL-955688-80/1; JPL-9950-598; QR-1) Avail: NTIS HC A03/MF A01 CSCL 10A

Materials including copper powders, silver-fluoride, and silicon wafers were procured and copper pastes were prepared. Electrodes made with copper pastes were analyzed and compared with the raw materials. A needle-like structure was observed on the electroded solar cells, and was identified as eutectic copper-silicon by electron probe X-ray spectroscopy. The existence of this phase was thought to benefit electrical and metallurgical properties of the contact. Subsequently electrodes made from new material were also shown to contain this phase while simultaneously having poor adhesion. J.M.S.

N82-10500*# Optical Coating Lab., Inc., City of Industry, Calif. Photoelectronics Div.
SILICON SOLAR CELL PROCESS DEVELOPMENT, FABRICATION AND ANALYSIS Annual Report, 1 Jul. 1980 - 30 Jun. 1981
H. I. Yoo, P. A. Iles, and D. C. Leung 31 Jun. 1981 100 p refs Sponsored in part by DOE
(Contract JPL-955089)
(NASA-CR-163787; DOE/JPL-955089-81/12; JPL-9950-597) Avail: NTIS HC A05/MF A01 CSCL 10A

Solar cells were fabricated from EFG ribbons dendritic webs, cast ingots by heat exchanger method, and cast ingots by ubiquitous crystallization process. Baseline and other process variations were applied to fabricate solar cells. EFG ribbons grown in a carbon-containing gas atmosphere showed significant improvement in silicon quality. Baseline solar cells from dendritic webs of various runs indicated that the quality of the webs under investigation was not as good as the conventional CZ silicon, showing an average minority carrier diffusion length of about 60 um versus 120 um of CZ wafers. Detail evaluation of large cast ingots by HEM showed ingot reproducibility problems from run to run and uniformity problems of sheet quality within an ingot. Initial evaluation of the wafers prepared from the cast polycrystalline ingots by UCP suggested that the quality of the wafers from this process is considerably lower than the conventional CZ wafers. Overall performance was relatively uniform, except for a few cells which showed shunting problems caused by inclusions. T.M.

N82-10501*# Wyle Labs., Inc., Huntsville, Ala.
AN ANALYTICAL COMPARISON OF THE EFFICIENCY OF SOLAR THERMAL COLLECTOR ARRAYS WITH AND WITHOUT EXTERNAL MANIFOLDS Final Report
Sep. 1981 30 p
(Contract DEN8-000006)
(NASA-CR-161852) Avail: NTIS HC A03/MF A01 CSCL 10A

An analytical comparison of the efficiency of solar thermal

collector arrays with and without external manifolds is reported. A FORTRAN computer program was written for the computation of the thermal performance of solar thermal collector arrays with and without external manifolds. Arrays constructed from two example solar thermal collectors are computated. Typical external manifold sizes and thermal insulations are presented graphically and are compared with the thermal performance of the collector alone. E.A.K.

N82-10502*# Wyle Labs., Inc., Huntsville, Ala.
PERFORMANCE EVALUATION OF THE SOLAR KINETICS T-700 LINE CONCENTRATING SOLAR COLLECTOR Final Report
Sep. 1981 49 p
(Contract DEN8-000006)
(NASA-CR-161856) Avail: NTIS HC A03/MF A01 CSCL 10A

A performance evaluation of the solar kinetics T-700 line concentrating solar collector is reported. Collector descriptions, summary, test conditions, test equipment, test requirements and procedures, and an analysis of the various tests performed are described. E.A.K.

N82-10503*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECT OF POSITIVE PULSE CHARGE WAVEFORMS ON THE ENERGY EFFICIENCY OF LEAD-ACID TRACTION CELLS Final Report
John J. Smithrick Sep. 1981 11 p refs
(Contract DE-AI01-77CS-51044)
(NASA-TM-82709; E-991; DOE/NASA/51044-22) Avail: NTIS HC A02/MF A01 CSCL 10A

The effects of four different charge methods on the energy conversion efficiency of 300 ampere hour lead acid traction cells were investigated. Three of the methods were positive pulse charge waveforms; the fourth, a constant current method, was used as a baseline of comparison. The positive pulse charge waveforms were: 120 Hz full wave rectified sinusoidal; 120 Hz silicon controlled rectified; and 1 kHz square wave. The constant current charger was set at the time average pulse current of each pulse waveform, which was 150 amps. The energy efficiency does not include charger losses. The lead acid traction cells were charged to 70 percent of rated ampere hour capacity in each case. The results of charging the cells using the three different pulse charge waveforms indicate there was no significant difference in energy conversion efficiency when compared to constant current charging at the time average pulse current value. Author

N82-10504*# Wyle Labs., Inc., Huntsville, Ala.
EVALUATION OF ALL-DAY-EFFICIENCY FOR SELECTED FLAT PLATE AND EVACUATED TUBE COLLECTORS Final Contractor Report
Sep. 1981 158 p
(Contract DEN8-000006)
(NASA-CR-161866) Avail: NTIS HC A08/MF A01 CSCL 10A

An evaluation of all day efficiency for selected flat plate and evacuated tube collectors is presented. Computations are based on a modified version of the NBSIR 78-1305A procedure for all day efficiency. The ASHMET and NOAA data bases for solar insolation are discussed. Details of the algorithm used to convert total (global) horizontal radiation to the collector tilt plane of the selected sites are given along with tables and graphs which show the results of the tests performed during this evaluation. J.M.S.

N82-10505*# Stirling Thermal Motors, Inc., Ann Arbor, Mich.
EVALUATION OF THE POTENTIAL OF THE STIRLING ENGINE FOR HEAVY DUTY APPLICATION Final Report
R. J. Meijer and B. Ziph Oct. 1981 62 p refs
(Contract NAS3-22226)
(NASA-CR-165473) Avail: NTIS HC A04/MF A01 CSCL 10B

A 150 hp four cylinder heavy duty Stirling engine was evaluated. The engine uses a variable stroke power control system, swashplate drive and ceramic insulation. The sensitivity of the design to engine size and heater temperature is investigated. Optimization shows that, with porous ceramics, indicated efficiencies as high as 52% can be achieved. It is shown that the gain in engine efficiency becomes insignificant when the heater temperature is raised above 200 degrees F. E.A.K.

N82-10506*# DHR, Inc., Washington, D.C.
MARKET ASSESSMENT OF PHOTOVOLTAIC POWER SYSTEMS FOR AGRICULTURAL APPLICATIONS IN MEXICO
William Steigelmann and Itil Asmon (ARD, Inc.) Jul. 1981 135 p refs
(Contracts DEN3-180; DE-AI01-79ET-20485)
(NASA-CR-165441; DOE/NASA/0180-3) Avail: NTIS HC A07/MF A01 CSCL 10A

The first year of cost-competitiveness, the market potential, and the environment in which PV systems would be marketed and employed were examined. Market elements specific to Mexico addressed include: (1) useful applications and estimates of the potential market for PV systems; (2) power requirements and load profiles for applications compatible with PV usage; (3) operating and cost characteristics of power systems that compete against PV; (4) national development goals in rural electrification and rural services, technology programs and government policies that influence the demand for PV in Mexico; (5) financing mechanisms and capital available for PV acquisition; (6) channels for distribution, installation and maintenance of PV systems; and (7) appropriate methods for conducting business in Mexico. A.R.H.

N82-10507# Harvard Univ., Cambridge, Mass.
OPTIMIZATION OF TRANSPARENT ELECTRODE FOR SOLAR CELLS Technical Progress Report, 15 Dec. 1980 - 15 Jun. 1981
Roy G. Gordon 1981 5 p Prepared for Midwest Research Inst., Golden, Colo.
(Contract DE-AC02-77CH-00178)
(DE81-023359; SERI/PR-9318-1-T2) Avail: NTIS HC A02/MF A01

Fluorine-doped tin oxide films prepared from highly purified tetramethyl tin (TMT) were compared with films prepared under identical conditions using less pure TMT. No effects due to impurities were found. The use of thermocouples to measure the temperature of glass surfaces is unsatisfactory. The use of an infrared emission thermometer is recommended. DOE

N82-10508# California Univ., Livermore. Lawrence Livermore Lab.
MECHANICAL ENERGY STORAGE TECHNOLOGY PROJECT Annual Report, 1980
T. M. Barlow, W. T. Crothers, T. T. Chiao, D. N. Frank, D. M. King, and S. V. Kulkarni 1 May 1981 203 p refs
(Contract W-7405-eng-48)
(DE81-029753; UCRL-50056-80) Avail: NTIS HC A10/MF A01

Progress during 1980 in the development and evaluation of the energy-saving potential of flywheel energy storage systems for vehicles and for fixed-base power systems is reported. Activities related to transportation applications, fixed-base applications, fiber-composite materials technology, flywheel rotor and containment technology, advanced component technology, and project management are described. DOE

N82-10509# Boeing Co., Seattle, Wash.
SOLAR PROJECT DESCRIPTION FOR PUBLIC SERVICE COMPANY OF NEW MEXICO (LOT 7) SINGLE FAMILY RESIDENCE, RIO RANCHO, NEW MEXICO
6 Aug. 1981 58 p
(Contracts DE-AB01-76CS-31020; HUD-H-2372)
(DE81-027853; SOLAR/1084-81/50) Avail: NTIS HC A04/MF A01

A solar space heating/domestic hot water system employing 150 square feet air flat plate collectors and 20,000 pounds of rock for storage is described. The collector, storage, energy to load, and auxiliary heat subsystems and five modes of operation are described. Auxiliary space heating is provided by an electric strip heater in the air ducts. The hot water system consists of an 80 gallon solar preheating tank which supplies a 40 gallon

conventional tank. An electric heating element provides auxiliary heating in the preheat tank. DOE

N82-10510# Boeing Co., Seattle, Wash.
SOLAR PROJECT DESCRIPTION FOR COLORADO SUN-WORKS: SINGLE FAMILY
1981 74 p
(Contracts DE-AB01-76CS-31020; HUD-H-2372)
(DE81-028054; SOLAR/1051-81/50) Avail: NTIS HC A04/MF A01

A passive solar energy system for both space heating and domestic hot water preheating is described. The passive space heating system consists of a drum wall and direct gain system. Heat losses are reduced by a Beadwall movable insulation. The vertically stacked drums near the south wall form a drumwell chimney where heated air rises through ceiling vents above the drums into an open plenum area between the roof and the ceiling of the rooms. Additional vents from this plenum on the north side of the house provide a path for the warm air into the room. Earth berms on the north, east, and west sides of the house, a one foot covering of earth on the roof, and an entry vestibule are used. Cooling is enhanced by night ventilation. The hot water system consists of two 30 gallon tanks painted black and positioned next to the south wall. Original cost estimates for provisioning and installation of the solar system are given. DOE

N82-10511# Department of Housing and Urban Development, Washington, D. C.
SOLAR PROJECT DESCRIPTION FOR LIVING SYSTEMS SINGLE FAMILY RESIDENCE, DAVIS, CALIFORNIA
Oak Ridge, Tenn. DOE 31 Aug. 1981 75 p Prepared in cooperation with Boeing Co., Seattle
(Contract DE-AB01-76CS-31020)
(DE81-029743; SOLAR/1046-81/50) Avail: NTIS HC A04/MF A01

Two independent systems are described - a direct gain passive solar space heating system and an active domestic hot water preheating system. Large south-facing windows and a clerestory skylight permit direct winter Sun to enter the house. Solar energy thermal storage is provided by both water filled tubes and the concrete slab floor. Movable shutters and insulating curtains provide capability to reduce night heat losses. Summer overheat protection is provided by roof overhangs and by natural ventilation. The collector, storage, heating load, and auxiliary loads subsystems and modes of operation are described for both systems. The house is instrumented for thermal performance evaluation. Original cost estimates for provisioning and installation of the solar system are given. DOE

N82-10512# Midwest Research Inst., Kansas City, Mo. Solar Energy Research Inst.
ENERGY END-USE REQUIREMENTS IN MANUFACTURING, VOLUME 1
Dilip R. Limaye (Synergic Resources Corp.), Steven Isser (Synergic Resources Corp.), Roy Beatty (Synergic Resources Corp.), Glenn Colville (Synergic Resources Corp.), Karen Lang (Synergic Resources Corp.), and Frank Krawiec Jul. 1981 233 p refs
(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(DE81-028975; SERI/TR-733-790R-Vol-1) Avail: NTIS HC A11/MF A01

A review and evaluation of existing industrial energy data bases were undertaken to assess their potential for supporting SERI research to analyze technical and economic feasibility of solar technologies, and to establish multilayer R and D programs for: solar thermal industrial electric power systems and solar IPH systems. In the review of existing industrial energy data bases, the level of detail, disaggregation, and primary sources of information were examined. The focus was on fuels and electric energy used for heat and power purchased by the manufacturing subsector and listed by 2-, 3-, and 4-digit SIC, primary fuel, and end use. DOE

N82-10513# Sandia Labs., Albuquerque, N. Mex.
FREQUENCY RESPONSE ANALYSIS OF FLUID CONTROL SYSTEMS FOR PARABOLIC-TROUGH SOLAR COLLECTORS
R. Schindwolf Jul. 1981 29 p refs
(Contract DE-AC04-76DP-00789)
(DE81-029293; SAND-80-0385) Avail: NTIS HC A03/MF A01

A linearized steady-state frequency response is derived for parabolic-trough collectors and for connecting piping that can be used in standard gain-phase analyses to evaluate system stability and closed-loop frequency response. The frequency-response characteristics of a typical collector string and piping are used in a gain-phase analysis to get some insight into the effect on system stability of various system parameters such as controller gain, sensor and controller-time constants, and sensor location. DOE

N82-10514# Massachusetts Inst. of Tech., Cambridge.
OESYS: A SIMULATION TOOL FOR NONCONVENTIONAL ENERGY APPLICATIONS ANALYSIS. THEORETICAL AND OPERATIONAL DESCRIPTION WITH USER DOCUMENTATION
Thomas L. Dinwoodie Aug. 1980 190 p refs
(Contract DE-AM01-76EI-02295)
(DE81-029701; MIT-EL-80-022) Avail: NTIS HC A09/MF A01

A method is developed for assessing both the operational and economic performance of variable mixes of energy conversion technologies within their specific service environments. This method is incorporated into OESYS (Optional Energy Systems Simulator), a computer model with the specific capability to assess conditions of economic viability and service reliability for energy project evaluation. The OESYS program is especially well suited to handle stochastic (weather dependent) generation technologies, and simultaneously handles the generation, transfer, and demand of multiple energy quality levels (electricity, high/low grade thermal, liquid/gaseous fuels, etc.). The model can be applied to most use sectors, including residential, commercial, industrial, and institutional, or combinations of use sectors. A model summary description is given. A theoretical description of the types of energy applications handled by OESYS, an operational description of the model, user documentation, and three sample studies are included. DOE

N82-10515# Science Applications, Inc., McLean, Va. Electro-Optics Technology Div.
TECHNICAL AND ECONOMIC ASSESSMENT OF SOLAR THERMOPHOTOVOLTAIC CONVERSION Final Report, Jul. 1981
W. Koechner, H. R. Verdun, and N. C. Wyeth Jul. 1981 190 p refs Sponsored by Electric Power Research Inst.
(EPRI Proj. 1415-1)
(DE81-803762; EPRI-AP-1940) Avail: NTIS HC A09/MF A01

The solar thermophotovoltaic (STPV) conversion concept is aimed at large-scale electric utility applications. After consideration of several options, a conceptual system arrangement was chosen an analyzed to provide calculations for STPV system configuration, size, performance, and cost. Baseline designs were selected fo the optical and converter subsystems, and a detailed analysis of the performance of these subsystems was made using mathematical models an computer codes. The various subsystems operating parameters were related to overall sytem performance and cost, and a minimum cost/power output point was found for the conceptual system. DOE

N82-10516# Veda, Inc., Camarillo, Calif.
ECONOMIC ANALYSIS OF THE UNIFIED HELIOSTAT ARRAY
7 Nov. 1980 395 p refs
(Contract DE-AC03-80SF-10802)
(DE81-026698; DOE/SF-10802/T4;
VEDA-43905-80U/P0069) Avail: NTIS HC A17/MF A01

The array (UHA) is comprised of conventional two-axis heliostats mounted on a terraced south-facing wall of a single structure. The arrangement of heliostats on the array is chosen to eliminate or control the degree of inter-heliostat shading and blocking. The UHA was investigated as to cost and optical performance. Two heliostats, the Veda Industrial Heliostat (VIH) and the Repowering Helistat were investigated in conjunction with the UHA. The UHA is found to be a viable candidate for solar thermal central receiver applications. The UHA-VIH

combination was shown to provide very high flux densities and to be suitable for high temperature applications in the 1000 K to 2000 K range. These temperatures were shown to be achieve even with very small (1 MWt) collector fields. DOE

N82-10517# Atlanta Univ., Ga. Dept. of Chemistry.
COOPERATIVE PROGRAM OF APPLIED ENERGY RESEARCH TECHNOLOGY DEVELOPMENT Final Technical Report, 1 Oct. 1979 - 31 Dec. 1980
1980 140 p refs Prepared in cooperation with Georgia Inst. of Technology, Atlanta
(Contract DE-FG05-79ET-60058)
(DE81-028916; DOE/ET-60058/T1) Avail: NTIS HC A07/MF A01

Studies conducted by groups at Atlanta University and the Georgia Institute of Technology Engineering Experiment Station are described. These efforts were proposed as exploratory studies in the area of alternative energy technologies as preliminary work leading to a multi-year program of specific developmental efforts. Topics chosen were supportive of on-going research programs at the two institutions. Work proposed included pertinent literature search, computer modeling, initial choices of systems, and preliminary parametric studies. DOE

N82-10518# Wayne State Univ., Detroit, Mich. Dept. of Chemistry.
CUPROUS OXIDE PHOTOVOLTAIC CELLS Final Report, 9 Apr. 1979 - 31 Jan. 1981
D. Trivich 1981 116 p refs
(Contract DE-AC02-79ET-23010)
(DE81-028927; DOE/ET-23010/T10) Avail: NTIS HC A06/MF A01

Research is described which deals with heterojunctions on Cu2O, MIS structures, effect of impurities in Cu2O, new etching procedures, junction formation by reduction of Cu2O to Cu through hydrogen ion bombardment, theoretical analysis of the hydrogen-reduced cells, a new method of measuring diffusion length in Cu2O, and measurement of the absorption coefficient of Cu2O. The factor most improved was the open circuit voltage, V/sub oc/, which was increased from 0.35 V to 0.7 V. DOE

N82-10519# Lincoln Lab., Mass. Inst. of Tech., Lexington.
PERFORMANCE OF TERRESTRIAL PHOTOVOLTAIC MODULES AT MIT LINCOLN LABORATORY EXPERIMENTAL PHOTOVOLTAIC SYSTEMS
S. E. Forman 30 Apr. 1981 19 p refs
(Contract DE-AC02-76ET-20279)
(DE81-029995; DOE/ET-20279/140) Avail: NTIS HC A02/MF A01

Through a program of periodic surveillance, measurements and inspections, over 250 electrically failed modules were located, removed and analyzed during a four-year period. The principal causes of failure were: cells cracked due to weathering or internal module stresses; failed solder joints; interconnects not soldered to rear sides of cells at assembly; cells or interconnects electrically shorted to metallic substrates; and broken or split interconnects. Details and photographs of many of the different typs of failures are presented. In addition, some of the analysis techniques used to locate the failures are described. DOE

N82-10520# Cornell Univ., Ithaca, N. Y.
STUDIES OF PHOTOSYNTHETIC ENERGY CONVERSION
R. K. Clayton Jul. 1981 20 p refs
(Contract DE-AS02-76ER-03162)
(DE81-028313; DOE/ER-03162/T1) Avail: NTIS HC A02/MF A01

Spectroscopic studies are reported on the major pigmented components of bacterial photosynthetic membranes: antenna complexes and photochemical reaction centers of Rhodopseudomonas sphaeroides and related species. Through optical studies with polarized light, combining the techniques of linear dichroism and photoselection, the relative orientations were determined of pigment molecules in reaction centers and antenna complexes and in relation to the photosynthetic membrane. Fairly complete angular coordinates were obtained of bacterio-chlorophyll (bchl) and bacteriopheophytin in the reaction centers, and less detailed information about antenna pigments (bchl and carotenoids) and bound cytochromes. DOE

N82-10521# Chicago Univ., Ill. Enrico Fermi Inst.
INTEGRATED FUNCTION NONIMAGING CONCENTRATING COLLECTOR TUBES FOR SOLAR THERMAL ENERGY Technical Progress Report
Roland Winston and Joseph J. OGallagher 25 Aug. 1981 21 p refs
(Contract DE-AC02-80ER-10558)
(DE81-029677; DOE/ER-10558/2) Avail: NTIS HC A02/MF A01

A substantial improvement in optical efficiency over contemporary external reflector evacuated tube collectors was achieved by integrating the reflector surface into the outer glass envelope. The design, fabrication and preliminary test results are described for a prototype collector based on this concept. Efficiencies above 40% up to nearly 300 C may be achieved. DOE

N82-10522# Battelle Pacific Northwest Labs., Richland, Wash.
OPERATIONAL CHARACTERISTICS OF ANAEROBIC DIGESTERS AT SELECTED WASTEWATER-TREATMENT FACILITIES IN THE UNITED STATES
Jul. 1981 46 p refs
(Contract DE-AC01-76CS-20300)
(DE81-030144; DOE/CS-20300/2) Avail: NTIS HC A03/MF A01

The effectiveness of powered activated carbon in improving volatile solids destruction and gas production in anaerobic digesters that are operating at less than normally expected levels of efficiency was studied. Digester operating characteristics were surveyed and the number of stressed digesters estimated. It is shown that although median values of the operating parameters conformed with those of a well operated digester, 30 percent of the digesters surveyed were stressed with regard to at least one important parameter. Digester gas production and usage are examined to determine the importance of methane off gas as an energy source. Onsite uses include heating digesters and buildings, incinerating sludge, operating equipment, and generating electricity. DOE

N82-10523# Exide Management and Technology Co., Yardley, Pa.
HANDBOOK OF SECONDARY STORAGE BATTERIES AND CHARGE REGULATORS IN PHOTOVOLTAIC SYSTEMS Final Report
Albuquerque, N. Mex. Sandia National Labs. Aug. 1981 189 p refs Prepared in cooperation with Motorola, Inc., Scottsdale, Ariz., Sandia National Labs., Albuquerque, N. Mex., Exide Corp., Horsham, Pa., and Exide Corp., Raleigh, N.C.
(Contract DE-AC04-76DP-00789)
(DE81-029464; SAND-81-7135) Avail: NTIS HC A09/MF A01

Solar photovoltaic systems often require battery subsystems to store reserve electrical energy for times of zero insulation. This handbook is designed to help the system designer make optimum choices of battery type, battery size and charge control circuits. Typical battery performance characteristics are summarized for four types of lead-acid batteries: pure lead, lead-calcium and lead-antimony pasted flat plate and lead-antimony tubular positive types. Similar data is also provided for pocket plate nickel cadmium batteries. Economics plays a significant role in battery selection. Relative cost of each battery type are summarized under a variety of operating regimes expected for solar PV installations. DOE

N82-10524# Little (Arthur D.), Inc., Cambridge, Mass.
LARGE WIND TURBINE GENERATOR PERFORMANCE ASSESSMENT, TECHNOLOGY STATUS REPORT NO. 3 Interim Report
W. A. Vachon Jul. 1981 136 p refs Sponsored by Electric Power Research Inst.
(EPRI Proj. 1348-1)
(DE81-903763; EPRI-AP-1959) Avail: NTIS HC A07/MF A01

Detailed summaries of test results are presented for the US Department of Energy's 200-kW MOD-0A horizontal-axis WTs that were interconnected with electric utilities at various locations around the United States. A description of the progress and experiences with both the MOD-1 1.5-MW WT and the cluster of three MOD-2 2.5-MW WTs is also presented, along with a

summary of plans for the DOE vertical-axis wind turbine program. A brief summary of Danish large WT programs is also provided. DOE

N82-10525# Hibbing Public Utilities Commission, Minn.
FEASIBILITY OF A SMALL SCALE PUMPED STORAGE DEMONSTRATION PROJECT, HIBBING, MINNESOTA
1981 229 p refs Prepared in cooperation with Hansen (James) and Associates, Springfield, Vt.
(Contract DE-AC07-76ID-01570)
(DE81-028678; DOE/TIC-1028678; IDO-10097) Avail: NTIS HC A11/MF A01

The economic and technical feasibility of developing a 5 to 15 MW pumped storage power plant was examined. The substitution of power from a pumped storage facility for the purchased peak power is advantageous because: (1) the coal fired cogeneration plant operates with an improved heat rate; (2) numerous open pits from abandoned iron ore mines are available as reservoirs for pumped storage; and (3) the peaking power generated does not depend on petroleum fuel. It is suggested that: eight mine sites are suitable for pumped storage; oil fired peak power units should be avoided to improve the efficiency of the existing cogeneration; this is a nonpolluting form of power generation; and the development of small scale reversible pump/turbine units for commercial operation is desirable. DOE

N82-10526# Oregon State Univ., Corvallis. Dept. of Mechanical Engineering.
HEAT PUMPS FOR SEASONAL THERMAL ENERGY STORAGE: OPERATION AND DESIGN
Gordon M. Reistad and William R. McMahon Nov. 1980 80 p refs
(Contracts DE-AT06-79RL-10121; DE-AM06-76RL-02227)
(DE81-025592; DOE/RL-10121/T1) Avail: NTIS HC A05/MF A01

A survey of commercial groundwater heat pump installations, and an analysis of residential-scale water-source heat pumps and their potential application to seasonal thermal energy storage in aquifers are presented. Through the survey, the operational experiences of large heat pumps using groundwater, with or without reinjection, were evaluated. A model of the residential-scale heat pump and aquifer system was made and evaluated for energy performance over a range of parameters for the heat pump, the aquifer and the heating load being met from the heat pump. DOE

N82-10527# Acres American, Inc., Buffalo, N.Y.
PRELIMINARY DESIGN STUDY OF UNDERGROUND PUMPED HYDRO AND COMPRESSED-AIR ENERGY STORAGE IN HARD ROCK. VOLUME 1: EXECUTIVE SUMMARY Final Report
May 1981 111 p Sponsored in part by Electric Power Research Inst. Prepared for Potomac Electric Power Company, Washington, D.C.
(Contract DE-AC02-77ET-28013; EPRI Proj. 1081-1)
(DE81-029440; EPRI-EM-1589-Vol-1; DOE/ET-5047/1) Avail: NTIS HC A06/MF A01

A preliminary design study of water compensated Compressed Air Energy Storage (CAES) and Underground Pumped Hydroelectric (UPH) plants for siting in geological conditions suitable for hard rock excavations was performed. The study was divided into five primary tasks as follows: establishment of design criteria and analysis of impact on power system; selection of site and establishment of site characteristics; formulation of design approaches; assessment of environmental and safety aspects; and preparation of preliminary design of plant. The salient aspects considered and the conclusions reached during the consideration of the five primary tasks for both CAES and UPH are presented. DOE

N82-10528# Acres American, Inc., Buffalo, N.Y.
PRELIMINARY DESIGN STUDY OF UNDERGROUND PUMPED HYDRO AND COMPRESSED-AIR ENERGY STORAGE IN HARD ROCK. VOLUME 2: PROJECT DESIGN CRITERIA: UPH Final Report
May 1981 185 p refs Sponsored in part by Electric Power Research Inst. Prepared for Potomac Electric Power Co., Washington, D.C.
(Contract DE-AC02-77ET-28013; EPRI Proj. 1081-1)
(DE81-028107; EPRI-EM-1589-Vol-2; DOE/ET-5047/2) Avail: NTIS HC A09/MF A01

The design criteria for an underground pumped hydroelectric (JPH) storage facility having a maximum generating capacity of 2000 MW and a storage capacity of 20,000 MWh at a nominal head of 5000 ft are documented. The UPH facility is a two step configuration with single stage reversible pump turbines, each step consisting of a 1000 MW plant at a nominal head of 2500 ft. Overall design criteria including operating requirements, civil/structural criteria, geotechnical criteria, mechanical criteria and electrical criteria are detailed. Specific requirements are given for the upper reservoir, intake/outlet structure, penstock and draft tubes, powerhouses, transformer galleries, intermediate reservoir, lower reservoir, shafts and hoists, switchyard and surface buildings. The requirements for the power plant electrical and mechanical equipment, including pump turbine and motor generator units, are referred to. Electrical design criteria are given to meet the requirements of two power houses located underground at different depths, but these criteria may not necessarily reflect PEPCO's current engineering practice. The criteria refer to a specific site and take into account the site investigation results. The design criteria given were used as the basis for the plant design. DOE

N82-10529# Acres American, Inc., Buffalo, N.Y.
PRELIMINARY DESIGN STUDY OF UNDERGROUND PUMPED HYDRO AND COMPRESSED-AIR ENERGY STORAGE IN HARD ROCK. VOLUME 5: SITE SELECTION Final Report
Apr. 1981 148 p refs Sponsored in part by Electric Power Research Inst. Prepared for Potomac Electric Power Co., Washington, D.C.
(Contract DE-AC02-77ET-28013; EPRI Proj. 1081-1)
(DE81-028199; EPRI-EM-1589-Vol-5; DOE/ET-5047/5) Avail: NTIS HC A07/MF A01

A six-step site selection process undertaken to identify and subsequently rank potential sites suitable for either an underground pumped hydroelectric (UPH) facility, or a water-compensated hard-rock cavern compressed air energy storage (CAES) facility is described. The region of study was confined to the service area of the Potomac Electric Power Company (PEPCO) and contiguous areas. Overriding considerations related to geology, environmental impact and transmission-line routing were studies within the context of minimizing plant costs. The selection process led to the identification of several sites suitable for the development of either a CAES or an UPH facility. Design development and site exploration at the selected site are described. DOE

N82-10530# Acres American, Inc., Columbia, Md.
PRELIMINARY DESIGN STUDY OF UNDERGROUND PUMPED HYDRO AND COMPRESSED-AIR ENERGY STORAGE IN HARD ROCK. VOLUME 9: DESIGN APPROACHES, CAES. APPENDIX D: MECHANICAL SYSTEMS Final Report
Apr. 1981 104 p Sponsored in part by Electric Power Research Inst. Prepared for Potomac Electric Power Company, Washington, D.C.
(Contract DE-AC02-77ET-28013; EPRI Proj. 1081-1)
(DE81-028200; EPRI-EM-1589-Vol-9-App-D; DOE/ET-5047/9D) Avail: NTIS HC A06/MF A01

The development of the design approach taken for the mechanical systems included in a compressed air energy storage (CAES) facility were documented. Design approaches developed the fuel oil system, water supply system, waste treatment system, fire protection and safety system, and miscellaneous plant services are based on similar designs for conventional utility plants because the operating characteristics, design parameters, and equipment capabilities for CAES plant mechanical systems are similar to standard utility systems. The design approach for each of these systems develops several alternatives for achieving the CAES plant requirements in each area. The preferred alternative is then expanded into a preliminary system description. DOE

N82-10531# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.

MATERIALS AND MOLECULAR RESEARCH DIVISION REPORT, 1980 Annual Report
Jun. 1981 562 p refs
(Contract W-7405-eng-48)
(DE81-027828; LBL-12000) Avail: NTIS HC A24/MF A01

Progress made in the following research areas is reported: materials sciences (metallurgy and ceramics, solid state physics, materials chemistry); chemical sciences (fundamental interactions, processes and techniques); nuclear sciences; and fossil energy. Advanced isotope separation technology, energy storage, magnetic fusion energy, and nuclear waste management are also discussed. DOE

N82-10532# GeoTrans, Inc., Herndon, Va.
REVIEW OF SIMULATION TECHNIQUES FOR AQUIFER THERMAL ENERGY STORAGE (ATES)
James W. Mercer, Charles R. Faust, William J. Miller, and F. J. Pearson, Jr. Mar. 1981 225 p refs Prepared in cooperation with INTERA, Environmental Consultants, Inc., Houston, Texas Prepared for Pacific Northwest Lab., Richland, Washington
(Contract DE-AC06-76RL-01830)
(DE81-029943; PNL-3769) Avail: NTIS HC A10/MF A01

The analysis of aquifer thermal energy storage (ATES) systems rely on the results from mathematical and geochemical models. Therefore, the state-of-the-art models relevant to ATES were reviewed and evaluated. These models describe important processes active in ATES including ground-water flow, heat transport (heat flow), solute transport (movement of contaminants), and geochemical reactions. In general, available models of the saturated ground-water environment are adequate to address most concerns associated with ATES; that is, design, operation, and environmental assessment. In those cases where models are not adequate, development should be preceded by efforts to identify significant physical phenomena and relate model parameters to measurable quantities. DOE

N82-10533# California Univ., Livermore. Lawrence Livermore Lab. Transportation Systems Research.
PRELIMINARY DESIGN AND ANALYSIS OF ALUMINUM-AIR CELLS PROVIDING FOR CONTINUOUS FEED AND FULL UTILIZATION OF ANODES
John F. Cooper 16 Aug. 1981 9 p refs
(Contract W-7405-eng-48)
(DE81-030479; UCID-19178) Avail: NTIS HC A02/MF A01

The advantages, disadvantages, and engineering problem areas of the wedge shaped cells in anodes utilization are reviewed. The importance of solution side current collection to the practicality of this approach when used with alkaline electrolytes is identified. The relationship between cell height and total anode mass is derived for this and corresponding cells of the M1 design. It is concluded that the M1-CF design may provide the basis for an automotive battery of greater simplicity, reliability, and economy than earlier designs. DOE

N82-10534# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
STANDARDS APPLICATION AND DEVELOPMENT PLAN FOR SOLAR THERMAL TECHNOLOGIES
H. R. W. Cobb Jul. 1981 218 p refs
(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(DE81-030310; SERI/TR-742-885) Avail: NTIS HC A10/MF A01

Functional and standards matrices, developed from input from ST users and from the industry that will be continually reviewed and updated as commercial aspects develop are presented. The matrices highlight codes, standards, test methods, functions and definitions that need to be developed. They will be submitted through ANSI for development by national consensus bodies. A contingency action is proposed for standards development if specific input is lacking at the committee level or if early development of a standard would hasten commercialization or gain needed jurisdictional acceptance. T.M.

N82-10535# Brobeck (William M.) and Associates, Berkeley, Calif.
DYNAMIC STABILITY OF STACKED DISK TYPE FLYWHEELS
F. C. Younger Apr. 1981 47 p refs Prepared for California Univ., Lawrence Livermore Lab.
(Contract W-7405-eng-48)
(DE81-030008; UCRL-15372) Avail: NTIS HC A03/MF A01

A flywheel assembly formed from adhesively bonded stacked fiber composite disks was analyzed. The stiffness and rigidity of the assembly required to prevent unconrolled growth in the deformations due to centrifugal force was determined. It is shown that stacked disk type flywheels become unstable when the speed exceeds a critical value. This critical value of speed depends upon the stiffness of the bonded attachments between the disks. It is found that elastomeric bonds do not provide adequate stiffness to insure dynamic stability for high speed stacked disk type flywheels. DOE

N82-10536# Tata Energy Research Inst., Bombay (India). Documentation Center.
WATER-PUMPING-WINDMILL DESIGNS: A HANDBOOK
Tarangini Rastogi, comp. and Narsing R. Rao, comp. Jun. 1981 162 p refs
(DE81-904016; NP-1904016) Avail: NTIS HC A08/MF A01

Windmills are becoming an attractive proposition for water pumping in the rural areas. Information on designs of water pumping windmills which could be constructed with inexpensive and locally available materials and skills is presented. This handbook covers about 23 indigeneous windmill designs and information such as name of the designer, institutional affiliation, type of windmill, specific applications and suitability, design features, and operating data wherever available. Most of these designs tested and were successfully used in different parts of the world. Commercially obtainable windmills listed along with complete address of the manufacturers and relevant technical specifications. T.M.

N82-10537# Los Alamos Scientific Lab., N. Mex.
STATE OF THE ART IN PASSIVE SOLAR HEATING
J. Douglas Balcomb 1981 4 p Presented at the Passive and Hybrid Solar Energy Program Update Meeting, Washington, D.C., 9-12 Aug. 1981
(Contract W-7405-eng-36)
(LA-UR-81-2185; CONF-810832-1) Avail: NTIS HC A02/MF A01

The state of the art is outlined according to four major categories: passive, solar practice, evaluation, design, and products and materials. Needed future research activities and point industry/government activities are listed. DOE

N82-10538# Los Alamos Scientific Lab., N. Mex.
LOS ALAMOS NATIONAL LABORATORY PASSIVE SOLAR PROGRAM
Donald A. Neeper 1981 12 p refs Presented at the Passive and Hybrid Solar Energy Program Update Meeting, Washington, D.C., 9-12 Aug. 1981
(Contract W-7405-eng-36)
(DE81-028778; LA-UR-81-2162; CONF-810832-2) Avail: NTIS HC A02/MF A01

Progress in passive solar tasks performed for FY-81 is documented. Twenty-eight configurations of sunspaces were studied using the solar load ratio method of predicting performance, the configuration showing best performance is discussed. The minimum level of insulation needed to generate convective flow in the thermosphon test rig is noted and measured. Information is also included on test room performance, off speak auxiliary electric heating for a passive home, free convection experiment, monitored building, and technical support to the US Department of Energy. DOE

N82-10539# Midwest Research Inst., Kansas City, Mo. Solar Energy Research Inst.
INVESTIGATION OF PHOTOVOLTAIC MECHANISMS IN POLYCRYSTALLINE THIN-FILM SOLAR CELLS Quarterly Report, 1 Aug. - 31 Oct. 1980
T. A. Temofonte 3 Apr. 1981 18 p refs
(Contract DE-AC02-77CH-00178)
(DE81-027272; SERI/PR-9233-1-T1; QR-1) Avail: NTIS HC A02/MF A01

Initial efforts focused on exploring the role of atomic hydrogen on silicon surfaces. The atomic hydrogen was generated using an inductively coupled plasma. Comparisons using Auger sputter

profiling were made of hydrogenated silicon surfaces, deliberately oxidized silicon surfaces and silicon surfaces having a native oxide. The auger spectrum of a hydrogenated silicon surface is initially qualitatively similar to that for an oxidized surface. Distinct differences emerge as a function of sputtering depth, ziv., the ratio of free silicon to bonded silicon decreases first before finally decreasing. This implies a significantly different surface composition for hydrogenated silicon compared to oxidized silicon. DOE

N82-10540# Mitre Corp., McLean, Va. Metrek Div.
STATUS OF THE DOE BATTERY AND ELECTROCHEMICAL TECHNOLOGY PROGRAM 2
R. Roberts Dec. 1980 279 p refs Presented at Dept. of Energy Battery and Electrochem. Contractor's Conf., 10-12 Dec. 1979
(Contract DE-AC01-79ET-25407)
(DE81-029879; DOE/ET-25407/1) Avail: NTIS HC A13/MF A01

The status of electrochemical storage systems is reviewed. Secondary batteries were recommended, however, selected mechanically rechargeable batteries and aspects of energy conservation in industrial electrochemistry were included. Batteries included are: lead acid, nickel/iron, nickel/zinc; advanced: lithium/metal sulfide, sodium/sulfur, zinc/chlorine; and research and development: metal/air, hydrogen/chlorine, zinc/bromine, redox, organic electrolytes, solid state. Electrode reactions, cell performance modeling, new battery materials are examined. Energy conservation and alternative processes in electrochemical industry are reviewed. The potential contributions of the battery program to the various missions supported such as electric vehicles, photovoitaic systems, distributed electrical energy systems, and energy conservation in industry are discussed. DOE

N82-10541# Sandia Labs., Albuquerque, N. Mex.
SOLAR ENERGY SYSTEM DESIGN: A SIMPLE METHOD FOR SIZING THE COLLECTOR FIELD AND THERMAL STORAGE
Ralph R. Peters Jul. 1981 81 p refs
(Contract DE-AC04-76DP-00789)
(DE81-028852; SAND-81-1541) Avail: NTIS HC A05/MF A01

The Zero Marginal Cost (ZMC) technique to enable quick, accurate designs of parabolic trough solar energy systems was developed. The ZMC technique is discussed and it is shown that systems designed with this technique compare quite favorably with those designed using expensive computer codes. DOE

N82-10542# SRI International Corp., Menlo Park, Calif.
CONCEPTUAL DESIGN OF A GLASS-REINFORCED CONCRETE SOLAR COLLECTOR
Arthur J. Slemmons. Dale W. Ploeger, and Ron Lundgren (Sandia Labs., Albuquerque, N. Mex.) Jul. 1981 51 p refs
(Contract DE-AC04-76DP-00789)
(DE81-029280; SAND-81-7011) Avail: NTIS HC A04/MF A01

An investigation of the properties and characteristics of glassfiber-reinforced concrete (GRC) was made to determine its suitability as a reflector substrate and structure for heliostats and solar collectors. The material properties and characteristics of GRC were established by tests on small flat panels. A conceptual design of a 2-m x 6-m parabolic trough solar collector module and a preliminary production-cost analysis were also completed. DOE

N82-10543# Boeing Computer Services, Inc., Seattle, Wash.
INTERMEDIATE PHOTOVOLTAIC-SYSTEM APPLICATION EXPERIMENT OPERATIONAL PERFORMANCE REPORT. VOLUME 1: FOR LOVINGTON SQUARE SHOPPING CENTER SITE, LOVINGTON, NEW MEXICO
Jul. 1981 18 p Prepared for Sandia Labs., Albuquerque, N. Mex.
(Contract DE-AC04-76DP-00789)
(DE81-028971; SAND-81-7085/1) Avail: NTIS HC A02/MF A01

A 100 kwp photovoltaic flat panel system is planned for application in a shopping center to assess problems associated with utility tie-in and to provide utility experience with a photovoltaic system. The project is briefly outlined, and the participants are listed. Relevant weather data and reference operating conditions are given and four operational modes are described. System specifications are given and the solar array, control, protection, and data acquisition and instrumentation subsystems are described. DOE

N82-10544# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
ENERGY END-USE REQUIREMENTS IN MANUFACTURING, VOLUME 3
F. Krawiec, Dilip R. Limaye (Synergic Resources Corp.), Steve Isser (Synergic Resources Corp.), Roy Beatty (Synergic Resources Corp.), Glenn Colville (Synergic Resources Corp.), and Karen Lang (Synergic Resources Corp.) Jul. 1981 624 p
(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(DE81-027976; SERI/TR-733-790R-Vol-3) Avail: NTIS HC A99/MF A01

Data on the US and state manufacturing subsectors' energy end use requirements disaggregated by 2 and 4 digit SIC and temperature level in 1990 are presented. DOE

N82-10545# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
DEVELOPMENT OF HIGH-EFFICIENCY-CASCADE SOLAR CELLS
Jul. 1981 5 p
(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(DE81-028145; SERI/PR-8136-1-T4) Avail: NTIS HC A02/MF A01

A comparative analysis of Mg and Be diffused GaAsSb junctions is described. It is found that Mg may be more suitable as the bottom cell dopant since it is less affected during subsequent layer growth. Increasing the number of grading layers with the composition of the bottom cell from one to six, the open circuit voltage increased from 0.3 to over 0.5 V. Results of the OM-CVD growth of GaAsSb are reported. Photoluminescence in the layers is mentioned. DOE

N82-10546# Potomac Electric Power Co., Washington, D.C.
PRELIMINARY DESIGN STUDY OF UNDERGROUND PUMPED HYDRO AND COMPRESSED-AIR ENERGY STORAGE IN HARD ROCK. VOLUME 3: PROJECT DESIGN CRITERIA: CAES Final Report
Apr. 1981 218 p Prepared in cooperation with Acres American, Inc., Columbia, Md.
(Contract DE-AC02-77ET-28013; EPRI Proj. 1081-1)
(DE81-028197; EPRI-EM-1589-Vol-3) Avail: NTIS HC A10/MF A01

The design criteria presented provided the basis for development of the design approaches and preliminary plant design. These design criteria are based, where possible, upon related facilities and experiences and are representative of normal utility practices. They cover the major plant equipment, systems, and facilities and the plant characteristics which depend upon or have an impact on plant surroundings. Project team studies and outside development contracts concentrated on those areas where current technology or practice does not provide adequate information to support plant design activities or economic analyses. DOE

N82-10547# Mid-American Solar Energy Complex, Minneapolis, Minn.
SUMMARY OF PASSIVE-SOLAR-RETROFIT WORKSHOPS
Jun. 1981 12 p
(Contract DE-AC02-79CS-30150)
(DE81-028146; MASEC-CF-81-028) Avail: NTIS HC A02/MF A01

Efforts are described to provide training in the latest passive solar retrofit techniques to a wide sector of residential design and construction professionals. Three 20-hour passive solar single-family retrofit workshops were attended by 116 residential construction-related participants. Each of the three workshops is described. The workshop topics and workbook were evaluated by 65 participants, and suggestions were made for improvement. DOE

N82-10548# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.

RAPID CHARGING OF LEAD-ACID BATTERIES FOR ELECTRIC-VEHICLE PROPULSION AND SOLAR-ELECTRIC STORAGE

P. Longrigg Jun. 1981 44 p refs
(Contracts EG-77-C-01-4042; DE-AC02-77CH-00178)
(DE81-028084; SERI/RR-742-1068) Avail: NTIS HC A03/MF A01

A survey of the various charging techniques that are available and that have been used extensively for lead acid batteries is presented. Descriptions of newer techniques involving gas evolution controlled charging are also included. An evaluation of fast charge approaches, with an analysis of battery state equations, is presented. DOE

N82-10549# Oak Ridge Y-12 Plant, Tenn. Fabrications Systems Dept.

COMPOSITE FLYWHEEL BALANCE EXPERIENCE

R. S. Steele 6 Apr. 1981 9 p refs Presented at the IECEC Conf., Atlanta, 9-14 Aug. 1981
(Contract W-7405-eng-26)
(DE81-769341; Y/DX-290; CONF-810812-2) Avail: NTIS HC A02/MF A01

The high performance composite flywheels which have properties useful in reducing the total energy requirements for automobiles were examined. This requires high rotational speeds and solution to the accompanying problems of fatigue and vibration control through balancing of the rotor. Demonstrated that composite flywheels, require significant balancing and expenses to meet the minimum balance requirements practiced in industry. Flywheels experience balance changes with speed changes. DOE

N82-10550# Burke, Davoud and Associates, Richmond, Va.

CANNON SHREDDING OF MUNICIPAL SOLID WASTE FOR THE PREPARATION OF BIOLOGICAL FEEDSTOCK Final Report

Jerry Burke Idaho Falls, Idaho Edgerton, Germeshausen and Grier, Inc. Apr. 1981 44 p
(Contract DE-FG01-79CS-20099)
(DE81-025850; DOE/CE-20088/01) Avail: NTIS HC A03/MF A01

Explosive decompression as a method of size reduction of materials found in municipal solid waste (MSW) was studied and preliminary data related to the handling and wet separation of exploded material was gathered. Steam was emphasized as the source of pressure. Municipal refuse was placed in an 8-ft long, 10.75-in. ID steel cannon which was sealed and pressurized. After an appropriate time, the cannon muzzle closure was opened and the test material expelled from the cannon through a constrictive orifice, resulting in explosive decompression. Flash evaporation of pressurized saturated water, expansion of steam, and the strong turbulence at the cannon muzzle accomplished size reduction. Hydraulic processing is shown to be an effective technique for separating heavy and light fractions. DOE

N82-10551# Science Applications, Inc., La Jolla, Calif.

PROGRAMMER'S MANUAL FOR THE DOEHPE (DOE HEAT PUMP EFFICIENCY) PROGRAM

23 Oct. 1980 76 p refs
(Contract DE-AC03-79CS-10757)
(DE81-769452; SAI-444-80-533-LJ) Avail: NTIS HC A05/MF A01

The computer code DOEHPE, which is used to calculate air source heat pump seasonal and annual performance factors and energy consumption is described. The program computes heating season performance factors, seasonal energy efficiency ratios, representative regional annual performance factors, representative regional annual energy consumption and national energy consumption from the standard measurements of heat pump capacity and power input and heat pump descriptive information as input data. The calculation for single and dual speed compressor heat pumps and single speed compressor heating only heat pumps are described. Representative regional performance factors are computed for each of six major climatic regions shown, for the US, and for each of the standard design heating requirements shown. DOE

N82-10552# Oak Ridge National Lab., Tenn. Energy Div.

ANNUAL CYCLE ENERGY SYSTEM

Robert E. Minturn 1981 6 p refs Presented at the Heat Pump Contractors' Program Integration Meeting, Washington, D.C., 2-4 Jun. 1981
(Contract W-7405-eng-26)
(DE81-024911; CONF-810672-16) Avail: NTIS HC A02/MF A01

The annual cycle energy system (ACES) program which incorporates in a practical system the outstanding energy conservation potential that exists when the unidirectional heat pump and the interseasonal storage of energy are combined to provide heating, cooling, and domestic hot water to buildings is described. Information on the system, its applicability to different geographic areas, and the methodology for designing and building systems are enumerated. It is shown that the system is rugged, reliable, and appreciably more conservative of purchased energy than all practical alternatives. An ACES residential design methodology was also developed. It is concluded that the system is constant in efficiency and capacity during winter operation, independent of extremes in weather, contributes to the reduction of peak demand and increases in daily and seasonal load factors. DOE

N82-10553# Argonne National Lab., Ill.

LIQUID-METAL MHD FOR SOLAR AND COAL

E. S. Pierson, D. Cohen, and S. J. Grammel 1980 10 p refs Presented at the 7th Intern. Conf on MHD Elect. Power Generation, Cambridge, Mass., 16-20 Jun. 1980
(Contract W-31-109-eng-38)
(DE81-023545; CONF-800617-8) Avail: NTIS HC A02/MF A01

The two phase generator, liquid metal magnetohydrodynamic energy conversion system has an inherently thermodynamic efficiency for the same heat source and sink temperatures and is better suited for cogeneration than other conversion systems. For solar applications, attractive efficiencies in comparison with alternative systems are calculated, and cogeneration advantages are indicated. For coal applications, recent coal combustion gas copper reaction results show that the copper can be used to control SO2 emissions. DOE

N82-10554# Argonne National Lab., Ill. Chemistry Div.

SUBSTANTIVE IMPROVEMENT OF THE THERMAL EFFICIENCY OF THE MERCURY-IODINE THERMOCHEMICAL CYCLE ANL-4

E. H. Appleman, B. M. Abraham, L. J. Basile, R. R. Richards, and F. Schreimer 1980 9 p refs Presented at the 3rd World Hydrogen Energy Conf., Tokyo, 23-26 Jun. 1980
(Contract W-31-109-eng-38)
(DE81-023573; CONF-800616-10) Avail: NTIS HC A02/MF A01

The mercury iodine thermochemical cycle ANL-4 was improved by the use of pure water instead of aqueous isopropanol as the solvent for the low temperature, water binding step, H2O + NH3 + CO2 + KI yields KHCO3 + NH4I. The modification reduces the amount of energy required to isolate the NH4I formed in this reaction and increases the overall thermal efficiency of the cycle to about 31%, based on delta G of formation of liquid water. DOE

N82-10555# Argonne National Lab., Ill. Chemical Engineering Div.

PHASE RELATIONSHIPS IN POSITIVE ELECTRODES OF HIGH-TEMPERATURE LITHIUM ALUMINUM/IRON SULFIDE CELLS

Z. Tomczuk, M. F. Roche, and D. R. Vissers 1980 14 p refs Presented at the Lithium Sulfide Symp. Electrochem. Soc., Hollywood, Fla., 5-10 Oct. 1980
(Contract W-31-109-eng-38)
(DE81-023816; CONF-8010159-11) Avail: NTIS HC A02/MF A01

The phases present in FeS and FeS2 positive electrodes of lithium aluminum/iron sulfide cells were detemined by X-ray diffraction and by metallographic examinations. The phases found in FeS electrodes were FeS, J(= LiK6Fe24S26Cl), Li2FeS2, Li2S, and Fe. The phases found in FeS2 electrodes were FeS2 KFeS2, Li3Fe2S4, Y phase (similar Li7,Fe2S6), Fe/sub 1-x/S, J, Li2S, and Fe. In the absence of potassium-containing phases, the

electrode phases are in accord with the Li-Fe-S phase diagram. DOE

N82-10556# Argonne National Lab., Ill.
NEAR-TERM BATTERIES FOR ELECTRIC VEHICLES
C. C. Christianson, N. P. Yao, and F. Hornstra 1981 9 p refs Presented at the 8th Energy Technol. Conf. and Expo, Washington, D.C., 9-11 Mar. 1981
(Contract W-31-109-eng-38)
(DE81-023543; CONF-810315-13) Avail: NTIS HC A02/MF A01

Major progress achieved in the lead-acid, nickel/iron and nickel/zinc battery technology development since the initiation of the Near-Term eV Battery Project in 1978 is reported. Against the specific energy goal of 56 wh/kg the demonstrated specific energies are 41 wh/kg for the improved lead-acid batteries, 48 wh/kg for the improved nickel/iron batteries, and 68 wh/kg for the improved nickel/zinc batteries. These specific energy values would allow an ETV-1 vehicle to have an urban range of 80 miles in the case of the improved lead-acid batteries, 96 miles for the improved nickel/zinc batteries, and 138 miles for the improved lead-acid batteries. All represent a significant improvement over the state-of-the-art lead-acid battery capability of about 30 wh/kg with approximately a 51 mile urban range for the ETV-1 vehicle. DOE

N82-10557# Argonne National Lab., Ill. Chemical Engineering Div.
RECENT PROGRESS IN LITHIUM/IRON SULFIDE BATTERY DEVELOPMENT
D. L. Barney, R. K. Steunenberg, and A. A. Chilenskes 1980 28 p refs Presented at the 15th Intersoc. Energy Conversion Eng. Conf., Seattle, 18-22 Aug. 1980
(Contract W-31-109-eng-38)
(DE81-023127; CONF-800806-46) Avail: NTIS HC A03/MF A01

The development of high temperature lithium/iron sulfide batteries for electric vehicle propulsion and stationary energy storage is described. In the Mark 2 program, various improvements are made in the cells and battery hardware to eliminate the potential failure mechanisms. In the cell development effort, multiplate cells with three positive and four negative electrodes were fabricated. A charger equilizer concept is developed, in which the major portion of the charge is added to the battery as a whole and then the individual cells are charged to a predetermined cutoff voltage. DOE

N82-10558# Lincoln Lab., Mass. Inst. of Tech., Lexington.
TESTING AND EVALUATION OF A SOLAR PHOTOVOLTAIC FLYWHEEL ENERGY STORAGE SYSTEM
Philip O. Jarvinen, Bronwyn L. Prench, R. Duncan Hay, and Neil F. Rasmussen (American Power Conversion, Burlington, Mass.) 1981 6 p Presented at the IECEC Conf., Atlanta, 9-14 Aug. 1981
(Contract DE-AC02-76ET-20279)
(DOE/ET-20279/130; CONF-810812-4) Avail: NTIS HC A02/MF A01

Measurements made on a 1/10 scale, magnetically levitated, residential solar photovoltaic (PV) flywheel energy storage system which acts as a complete interface between a solar PV array and an ac load are reported. The overall in/out electrical storage efficiency of the flywheel unit was measured along with the power transfer efficiencies of individual components and the system spin down tar losses. An overall storage efficiency of 82 percent was measured for the flywheel storage system when operated in a utility interactive mode. DOE

N82-10559# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
FABRICATION, TESTING, AND MODELING PLANS FOR A 125-KW COUNTER-ROTATING-TURBINE WAVE ENERGY CONVERTER
J. Miles and T. Penney Jun. 1981 12 p refs Presented at the 8th Ocean Energy Conf., Washington, D.C., 7-11 Jun. 1981
(Contract EG-77-C-01-4042)
(DE81-023946; SERI/TP-634/1215; CONF-810622-4) Avail: NTIS HC A02/MF A01

An air turbine accepting bi-directional flow and featuring counter-rotating turbine wheels is described. The turbine is for use with an oscillating water column and an air chamber to form a wave energy converter. Plans are presented for testing the turbine in a steady-state manner so as to obtain output torque and mass flow as functions of operational parameters. Concurrent modeling studies are described which will lead to the design of an optimized airchamber. DOE

N82-10560# Los Alamos Scientific Lab., N. Mex.
HOT DRY ROCK GEOTHERMAL ENERGY DEVELOPMENT PROGRAM Progress Report
Paul R. Franke 1981 17 p refs Presented at the IECEC Conf., Atlanta, 19 Aug. 1981
(Contract W-7405-eng-36)
(LA-UR-81-1265; CONF-810812-11) Avail: NTIS HC A02/MF A01

A hot dry rock geothermal system was developed from a reservoir created by hydraulic fracturing. A reservoir of sufficient size and capacity was confirmed and two extraction runs were made. The thermal drawdown data indicate that the effective heat area is increased. The reservoir enlargement is confirmed by gradual thermal drawdown, and the effective heat transfer area of the reservoir is increased. E.A.K.

N82-10561# Oak Ridge National Lab., Tenn. Energy Div.
WATER-RELATED CONSTRAINTS TO THE DEVELOPMENT OF GEOTHERMAL ELECTRIC GENERATING STATIONS
R. C. Robertson, Alf D. Shepherd, Carey S. Rosemarin, and Michael W. Mayfield Jun. 1981 160 p refs
(Contract W-7405-eng-26)
(DE81-025138; ORNL/TM-7718) Avail: NTIS HC A08/MF A01

The water related constraints concerning geothermal energy are discussed. Three different constraints are: (1) water requirements of geothermal power stations; (2) resource characteristics of the most promising hydrothermal areas and regional and local water supply situations; and (3) legal issues confronting potential users of water at geothermal power plants in the states in which the resource areas are located. A total of 25 geothermal resource areas were studied. It is found that each had a hydrothermal resource temperature in excess of 150 C and an estimated 30 year potential of greater than 100-MW(e) capacity. DOE

N82-10562# Montana Dept. of Natural Resources and Conservation, Helena.
MONTANA GEOTHERMAL HANDBOOK: A GUIDE TO AGENCIES, REGULATIONS, PERMITS AND FINANCIAL AIDS FOR GEOTHERMAL DEVELOPMENT
Steven Perlmutter and Jeff Birkby 1980 52 p
(Contract DE-FC07-79ID-12014)
(DE81-024315; DOE/ID-12014/T1) Avail: NTIS HC A04/MF A01

The handbook is divided into three parts: a list of the permits required for various thermal projects, and an estimate of time needed to obtain them; a brief discussion of the statutes and regulations referred to; and a description of the state and federal grant and loan funding available to a prospective geothermal developer. DOE

N82-10563# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
APPLICATION OF SOLAR THERMAL ENERGY TO BUILDINGS AND INDUSTRY
Charles F. Kutscher May 1981 32 p refs Presented at the Energy and the Man-Built Environment Conf., Vail, Colo., 3-5 Aug. 1981; sponsored by Am. Soc. of Civil Eng.
(Contract DE-AC02-77CH-00178)
(SERI/TP-641-1222; CONF-810808-6) Avail: NTIS HC A03/MF A01

Flat plate collectors and evacuated tube collectors are described, as are parabolic troughs, Fesnel lenses, and compound parabolic concentrators. Use of solar energy for domestic hot water and for space heating and cooling are discussed. Some useful references and methods of system design and sizing are given. This includes mention of the importance of economic analysis. The suitability of solar energy for industrial use is discussed, and solar ponds, point-focus receivers and central

receivers are briefly described. The use of solar energy for process hot water, drying and dehydration, and process steam was examined, industrial process heat field tests by the Department of Energy are discussed, and a solar total energy system in Shenandoah, GA is briefly described. DOE

N82-10564# Little (Arthur D.), Inc., Cambridge, Mass.
SOLAR HEATING AND COOLING (SHAC) SIMULATION PROGRAMS: ASSESSMENT AND EVALUATION. VOLUME 2: DETAILED FINDINGS Final Report
R. L. Merriam May 1981 247 p refs Sponsored by Electric Power Research Inst.
(EPRI Proj. 1269-1)
(EPRI-EM-1866-Vol-2) Avail: NTIS HC A15/MF A01

Solar heating and cooling system simulation programs available to use by electric utilities were identified, analyzed, tested and evaluated. The strengths and weaknesses of the more promising programs are highlighted. A comprehensive reference manual describing the characteristics of computer programs and manual methods was developed. The programs are described and ranked by application. Four programs are tested for three building types (residential, light commercial, heavy commercial) and three heating and cooling system classes (conventional, active solar, passive solar). The results are compared and related to the program's analytical bases. The user experience is highlighted and user related factors for the four programs are compared. The applicability of the programs to utilities is explored. DOE

N82-10565# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
MEASURED PERFORMANCE OF FALLING-JET FLASH EVAPORATORS
H. J. Green, D. A. Olson, D. Bharathan, and D. H. Johnson Jun. 1981 9 p refs Presented at the 8th Ocean Energy Conf., Washington, D.C., 7 Jun. 1981
(Contract EG-77-C-01-4042)
(DE81-024355; SERI/TP-631-1270; CONF-810622-3) Avail: NTIS HC A02/MF A01

The rates of heat transfer and approach to thermal equilibrium of flash evaporators operating at pressures of 2 to 4 kPa were investigated. Heat and mass transfer rates from falling jet evaporators operating in the temperature range of 18 to 30 C are measured. The initial experimental results are given and the apparatus is described. DOE

N82-10566# Paulling (J. Randolph), Inc., Orinda, Calif.
THEORY AND USER MANUAL FOR OTEC CW PIPE PROGRAMS ROTECF AND SEGPIP
J. Randolph Paulling Jul. 1980 193 p refs
(Contracts DE-AI01-79CS-20396; N00024-78-C-5384)
(DE81-023736; DOE/NOAA-OTEC-35) Avail: NTIS HC A09/MF A01

A quasi linear frequency domain analysis of the coupled OTEC CW pipe and platform system was developed. A finite element model of pipe structural dynamics is employed and the platform is modelled by contemporary ship or stable platform motion theory. Nonlinear fluid forces are included by the equivalent linearization method. An alternative procedure is presented for a pipe consisting of a number of rigid cylindrical segments linked together end to end. In both cases, the motions of nodes or joints and the internal stresses or joint forces are computed. DOE

N82-10567# Oak Ridge National Lab., Tenn.
DIRECT-CONTACT HEAT EXCHANGERS FOR OTEC: SOME ADVANTAGES AND DISADVANTAGES
R. N. Lyon 1981 6 p refs Presented at the 8th Ocean Energy Conf., Washington, D.C., 7-11 Jun. 1981
(Contract W-7405-eng-26)
(DE81-024253; CONF-810622-5) Avail: NTIS HC A02/MF A01

A direct contact evaporator for ocean thermal energy conversion was considered. Several advantages were enumerated: (1) removing the corrosion and fouling problems associated with closed heat exchangers: (2) permitting the plant to operate at above atmospheric pressure in comparison with an open Claude system; and (3) reducing capital costs. The potential loss of working fluid in the effluent seawater, for which there appears to be no state of the art recovery process that does not require serious consumption of otherwise net power is addressed. Potential loss of working fluid in the condenser off gases require stringent deaeration of the seawater. DOE

N82-10568# Institute of Gas Technology, Chicago, Ill.
ELECTROCHEMICAL PHOTOVOLTAIC CELLS Quarterly Technical Progress Report, 1 Nov. 1980 - 31 Jan. 1981
Peter G. P. Ang, Anthony J. Tiller, Anthony A. Rossignuolo, and Anthony F. Sammells Apr. 1981 24 p ref Sponsored in cooperation with Midwest Research Inst.
(Contract EG-77-C-01-4042)
(DE81-769704; SERI/PR-9175-1-T3) Avail: NTIS HC A02/MF A01

The photoelectrochemical properties of p-Si, p-InP, p-MoS2, and n-CdSe semiconductors are presented. A number of redox storage systems are discussed. Characteristics of single crystal systems and of surface treatments are investigated. Long term testing was performed with polycrystalline CdSe and with p-InP single crystal in electrochemical cells. The quality and long term stability of various electrodes, electrolytes, and separator materials are studied. DOE

N82-10569# Pennsylvania State Univ., University Park. Materials Research Lab.
CONTROLLED CADMIUM TELLURIDE THIN FILMS FOR SOLAR-CELL APPLICATIONS Quarterly Report, 1 Dec. 1980 - 1 Feb. 1981
M. B. Das and S. W. Krishnaswamy 15 May 1981 14 p refs
(Contract DE-AC02-77CH-00178)
(DE81-023275; SERI/PR-9131-1-T3; QR-3) Avail: NTIS HC A02/MF A01

Indium doped CdTe films cadmium vacancies occur which cause the presence of deep level acceptor states in the material are discussed. By sputtering at a cadmium overpressure, it was possible to compensate for these vacancies and improve the device quality. Extensive temperature dependent measurements of dark and illuminated I/V characteristics of gold metalized Schottky barrier diodes based on these improved and reproducible films were made. Characteristics showing I/sub sc/ and V/sub oc/ at different temperatures and different illumination level are presented. DOE

N82-10570# Sandia Labs., Albuquerque, N. Mex. Photovoltaic Projects Div.
SOLAR PHOTOVOLTAIC SYSTEM ENGINEERING PERSPECTIVES
Gary J. Jones 1981 7 p refs Presented at the Energy in Man-Built Environ.: The Next Decade Spec. Conf., Vail, Colo., 3 Aug. 1981
(Contract DE-AC04-76DP-00789)
(DE81-023179; SAND-81-1164C; CONF-810808-7) Avail: NTIS HC A02/MF A01

The activities of the national photovoltaic program which aid the photovoltaic system background information are presented and major issues are highlighted. DOE

N82-10571# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Space Div.
TECHNOLOGICAL ACTIVITIES FOR HIGH PERFORMANCE RECEIVERS Final Report
Guenther Schmidt, Erich Kirner, and Helmut Zewen Bonn Bundesministerium fuer Forschung und Technologie Dec. 1980 86 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-80-133; MBB-UR-39979-79; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 18.05

Preliminary studies were carried out on the optimization of the energy transfer efficiency from the incident solar radiation into the heat transfer medium of solar thermal plants by designing high performance receivers. The transfer efficiency has a direct impact on the overall plant efficiency and the size of the cost effective collector field. Two main lines were followed, closed Rankine cycles with organic heat transfer media at temperatures between 350 and 400 C; and gas turbine cycles at temperatures from 800 to 900 C. A test receiver cooled by organic media

was built and its thermal and mechanical resistance as well as the behavior of different heat transfer media with respect to thermal efficiency and stability were analyzed. Industrial application appears feasible. Author (ESA)

N82-10572# KA-Planungs G.m.b.H., Heidelberg (West Germany).
PRELIMINARY INVESTIGATION ON A PRIMARY ENERGY SAVING HEAT SUPPLY SYSTEM FOR THE RESIDENTIAL DISTRICT 'MARIA LINDENHOF' IN DORSTEN, WEST GERMANY Final Report
Alfred Bechtel, Klaus Berlinghoff, Hans Grossmann, Helmut Kaschube, and Friedrich Reinmuth Bonn Bundesministerium fuer Forschung und Technologie Dec. 1980 126 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-80-157; ISSN-0340-7608) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 26,50

Ways and means to operate a heating station by gas motor-driven heat pumps, using river water as heat source are investigated. The economic viability of the scheme is considered. A comparison with conventional technologies clearly shows the feasibility and effectiveness of this application, and at the same time supplies guidelines for design and dimensioning. Because of possible energy saving, the present investigation supports the realization of the project. Author (ESA)

N82-10573# Renault Vehicles Industriels (France). Direction des Etudes et Recherches.
ENERGY CONSUMPTION AND HEAVY-DUTY VEHICLES [LA CONSOMMATION D'ENERGIE ET LES POIDS LOURDS]
Yves Bonnetain 1980 18 p In FRENCH Presented at S.I.A. Journees Poids Lourds, Paris, 8-9 Oct. 1980
Avail: NTIS HC A02/MF A01

Research and analysis which leads to energy conservation in the operation of tractor-trailers (semis) was reviewed. Two approaches are emphasized: design improvements on the vehicle itself, and policies or dashboard instrumentation which result in a more efficient use of the vehicle. Evidence is presented to show that immediate and significant reductions in fuel consumption are possible merely by instigating more efficient driving practices, e.g., speed laws, governors on engines, etc. Author (ESA)

N82-10574# Acres American, Inc., Columbia, Md.
PRELIMINARY DESIGN STUDY OF UNDERGROUND PUMPED HYDRO AND COMPRESSED-AIR ENERGY STORAGE IN HARD ROCK. VOLUME 12: PLANT DESIGN, CAES Final Report
Apr. 1981 285 p Sponsored in part by Electric Power Research Inst. Prepared for Potomac Electric Power Company, Washington, D.C.
(Contract DE-AC02-77ET-28013; EPRI Proj. 1081-1)
(DE81-028110; EPRI-EM-1589-Vol-12; DOE/ET-5047/12)
Avail: NTIS HC A13/MF A01

Detailed designs were developed for the major components and systems of the CAES plant. These designs were based upon the preliminary economic and technical evaluations and alternative designs developed in Task 3C. The detailed project design drawings for the major plant systems and structures are presented. The site development report, updated cost estimate, cost/schedule risk study, reliability/availability, analysis, and recommendations for additional research and development are included. DOE

N82-10575# National Bureau of Standards, Washington, D.C. Electron Devices Div.
LASER SCANNING MEASUREMENTS ON SOLAR CELL TEST PATTERN NBS-22 Final Report, 1 Jun. 1980 - 30 Nov. 1981
W. F. Lankford, P. Kowalski, and H. A. Schafft May 1981 53 p refs Sponsored in part by Solar Energy Research Inst., Golden, Colo.
(Contract EG-77-C-01-4042)
(PB81-214157; NBSIR-81-2260) Avail: NTIS HC A04/MF A01 CSCL 10B

The NBS laser scanner was used to make measurements on the solar cell test pattern, NBS-22, to verify theoretical calculations. The photovoltaic response from cells with controlled sheet resistance step changes and breaks in the metallization contact to the cell was measured and compared to the theoretical predictions. Laser scanner limits of resolution were identified and proposed improvements were discussed. Preliminary measurements indicate that it is possible to measure the sheet resistance of the emitter layer of solar cells with an accuracy of several percent, using the laser scanner. GRA

N82-10576# Indian Lead Zinc Information Centre, New Delhi.
BATTERY
Nov. 1980 31 p refs
(PB81-120263; Rept-10) Avail: NTIS HC A03/MF A01 CSCL 10C

Contents: Outlook for lead, zinc and cadmium in India; Future for lead production and recycling - a British view; AKERLOW lead recovery plant; Expanded lead battery grids; Resume of first solder seminar in India; Automatic paste soldering adds sparks to zinc-carbon batteries; 122-ton lead battery used for testing BEST facility; Press release on Pb 80; Research and development; Second International Symposium on Industrial and Oriented Basic Electrochemistry; Industry news; Book review and new publications; Battery abstracts. GRA

N82-10577# Department of Agriculture, Washington, D.C.
THE YOUNG SOLAR COLLECTOR: AN EVALUATION OF ITS MULTIPLE FARM USES
Walter G. Heid, Jr. May 1981 21 p ref
(PB81-214132; AER-466) Avail: NTIS HC A02/MF A01 CSCL 13A

The features of the Young collector and reports on its physical and economic performance were studied. The collector is portable and tiltable, with a flexible airflow system. It is found that it satisfactorily dries grain, provides home heating, and saves energy. The homemade, low cost Young flat plate solar collector for multiple uses on the farm was designed by a farm couple and the small farm energy project. GRA

N82-10578 Texas Univ. at Dallas.
DESIGN, SIMULATION, FABRICATION, AND TESTING OF MEDIUM TEMPERATURE, LINEAR FRESNEL REFLECTOR COLLECTORS Ph.D. Thesis
Howard Newton McCalla 1981 184 p
Avail: Univ. Microfilms Order No. 8118225

Linear Fresnel reflectors were investigated with respect to performance in a solar collection system for the production of process heat or for use with absorption chillers. Computer models were developed for both north-south and east-west tracking linear concentrators composed of from 6 to 16 segments. The results were used to select parameters for two experimental arrays and to develop design criteria. Good correlation between the model and the experimental arrays is demonstrated over a limited range of tests. The model is used to make comparisons of north-south and east-west arrays for a range of parameters including array length, tilt angle, and the segment width/spacing ratio for periods up to one year. Arrays were designed and built with common materials, common sizes, and low cost technology. System economics were evaluated. Dissert. Abstr.

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N82-10579 Oklahoma Univ., Norman.
DEVELOPMENT OF A NATIONAL HAZARDOUS WASTE MANAGEMENT SYSTEM MODEL Ph.D. Thesis
Daniel Thomas Boatright 1981 318 p
Avail: Univ. Microfilms Order No. 8115346

The technical feasibility of an alternative system of hazardous waste management which would address the generation, storage, transportation, and disposal of the most tenacious hazardous wastes which cannot be treated by available technology is discussed. The essence of the model system is centered on wastes of the nature described being transported to regional staging areas, and once a pre-determined volume of waste is

accumulated, the waste would then be forwarded to a national hazardous waste ultimate disposal site located in a highly isolated and secure portion of the United States where the land to be used is owned by the Government and is dedicated in perpetuity to nonpublic and nonprivate uses. Once the model system was developed, the model was applied to radioactive wastes generated by a once through fuel cycle nuclear power plant serving a hypothetical population of 500,000 persons. It was determined that the model system was technically feasible and on an economic par with other hazardous waste option currently practiced and/or under consideration. Dissert. Abstr.

N82-10580 Texas Univ. at Dallas.
RELEASE OF NITROGEN COMPOUNDS FROM DREDGED SEDIMENT Ph.D. Thesis
Pinaki Bandyopadhyay 1981 259 p
Avail: Univ. Microfilms Order No. 8118223

Dredged material disposal from hopper and mechanical barge type dredges were monitored to determine the significance of nitrate, organic nitrogen and especially, ammonia release on water quality at the disposal site. The usefulness of elutriate tests in estimating nitrogen compound release from dredged sediment was also evaluated. Measurable ammonium concentrations were recorded in turbid plumes following disposal operations from hopper and mechanical type dredges. However, these elevated concentrations persisted at any specific point for only a few minutes. High ammonium concentrations observed near pipeline discharge points showed rapid dilution at short distances away. The elutriate test and plop test results provided a conservative estimate of ammonium release at hopper and mechanically dredged disposal sites. The general order of magnitude of ammonium release at pipeline discharge sites was predicted by the elutriate test. At pipeline disposal sites tidal influences and continuous discharge over a long period of time could potentially cause toxic and excessive growth problems. Dissert. Abstr.

N82-10581 Drexel Univ., Philadelphia, Pa.
PHYSICAL-CHEMICAL MECHANISMS OF THE REACTION OF OZONE WITH AQUATIC HUMIC SUBSTANCES Ph.D. Thesis
Paul C. Chrostowski 1981 308 p
Avail: Univ. Microfilms Order No. 8118926

The validity and use of ozone in water treatment for humics removal definition of concepts and terms used in ozonation practice, control of the process, the importance of mass transfer, and the chemical properties of the humics were investigated. The approach was to follow changes in different parameters as a function of time of ozonation in a heterogeneous reaction matrix. The results indicate that classical rate laws could be used to describe the reactions. All the reactions could be separated into three mechanisms: slow, reaction rate limited; slow mass transfer limited; and fast mass transfer limited. The importance of ozone decomposition, presence of inhibitors, and voltilization was also demonstrated. Rate curves were used to differentiate between oxidative coupling and degradative mechanisms. The information derived was utilized as input to a protocol for design of water treatment facilities utilizing ozone for organics control. The conditions of ozonation were defined such that control over the process and reproductability of results could be ensured. Dissert. Abstr.

N82-10582 University of Western Michigan, Kalamazoo.
STORM-SEWER INPUT OF HEAVY METALS INTO AN URBAN LAKE ENVIRONMENT Ph.D. Thesis
George Alexander Duba 1981 131 p
Avail: Univ. Microfilms Order No. 8117698

The concentration of lead, cadmium, zinc and copper in runoff entering an urban lake ecosystem and the distribution of these metals in selected tropic levels of the lakes were measured. Samples were collected on the basis of proximity to a storm sewer contaminated portion of the lake. It is suggested that: (1) metals not show highest concentrations at highest tropic levels; (2) lead, zinc and copper are detected in stormwater; (3) although some substrate was highly contaminated, the other tropic levels do not show similar contamination; (4) the benthic organisms, do not elevated concentrations along the food chain; (5) the two processes of analysis, PIXE and AA, give similar values; and (6) the fish of Fish Lake present little toxic danger of metal contamination. Dissert. Abstr.

N82-10583 Texas Univ. at Dallas.
OIL AND GAS INDUSTRY AND ENVIRONMENTAL POLLUTION: APPLICATION OF SYSTEMS RELIABILITY ANALYSIS FOR THE EVALUATION OF THE STATUS OF ENVIRONMENTAL POLLUTION CONTROL IN THE NIGERIAN PETROLEUM INDUSTRY Ph.D. Thesis
Azhinoto Ozodio Ikpah 1981 377 p
Avail: Univ. Microfilms Order No. 8118224

Current environmental pollution control policies, regulations, oil field management practices and programs for detection, inventory, prevention and control of oil spills/pollution in Nigeria were examined. The status of pollution control in the Nigerian petroleum industry was evaluated. Spill event data which were analyzed based on shore, category, systems, cause/effect relationip, clean-up method, violation and other parameters pertinent to pollution control in the oil industry. Spill data indicated that frequency of spill events is high; dispersant is indiscriminately used; more spills occur onshore; water disposal method is poor; and equipment failure, operators' maintenance error and third party account for a large number of spills. Pipes, valves and gaskets are spill vulnerable components, and the product spilled is generally crude oil. Few spill events were considered violations of federal laws. Standard engineering designs and criteria are employed in production of oil in Nigeria, but the level of investments on strictly pollution control equipments and personnel is minimal. It is concluded that legal and institutional arrangement for pollution control in the Nigerian petroleum industry need modification and updating. Dissert. Abstr.

N82-10584# Laboratorio de Acustica e Sonica, Sao Paulo (Brazil). Inst. de Engenharia.
THE INDUSTRIAL NOISE PROBLEM AND ITS EFFECTS AND SOCIAL IMPLICATIONS
L. X. Nepomuceno 24 Apr. 1979 41 p refs In PORTUGUESE; ENGLISH summary
Avail: NTIS HC A03/MF A01

Codes for reducing noise exposure to workers are examined and compared with the actual situation in Brazil. The degree of enforcement of existing regulations in that country is criticized. Economic factors associated with the loss of time from work, and the number of hearing disabilities among the working population indicate that a 90 dBA level that is obeyed is better than a ficticious 85 dBA level that is not followed in the majority of industries. A.R.H.

N82-10585# Oak Ridge National Lab., Tenn. Fossil Energy Information Center.
ENVIRONMENTAL COMPLIANCE PROGRAM HANDBOOK
Aug. 1981 332 p
(Contract W-7405-eng-26)
(DE81-030226; ORNL/EIS-171) Avail: NTIS HC A15/MF A01

Only by demonstrating that energy technologies can be built and operated without adverse environmental impact can these technologies be considered as proven and ready for commercialization by the private sector. This handbook is one of a series covering federal laws and regulations and the laws and regulations of selected states that pertain to air quality, water quality, and the identification and disposal of solid and hazardous wastes. The data summary sheets are part of a computer file. This handbook identifies and provides abstracts to those pertinent laws and regulations which were in force in the State of Ohio in early 1980. The permit forms are those in use during that time frame. T.M.

N82-10586# Michigan Univ., Ann Arbor. Dept. of Aerospace Engineering.
STUDY OF THE FORMATION OF SUBMICRON PARTICULATES GENERATED BY COAL COMBUSTION Quarterly Progress Report, 1 Apr. - 30 Jun. 1981
P. M. Sherman and D. R. Glass Jul. 1981 28 p refs
(Contract DE-FG22-80PC-30305)
(DE81-027447; DOE/PC-30305/T3; QPR-3) Avail: NTIS HC A03/MF A01

The formation of the very small particles was investigated

so that combustion and heat transfer conditions which will prevent their formulation can be identified. Emphasis was largely on perfecting techniques for obtaining electron microscope data which can be correlated with variations in heat transfer and combustion parameters. Improvements include better sealing of the furnace tube: provision for measurement of the entire flow field downstream of the flame; better control of the exhaust stream; better control of the coal dust feeder; and better control of the temperature of the secondary air. Program focus on particles in the 50 A to 0.1 micron range. These were largely overlooked in the past because they are difficult to detect. T.M.

N82-10587# International Research and Technology Corp., McLean, Va.
PROCEEDINGS: WORKSHOP ON CYCLING AND EFFECTS OF TOXIC SUBSTANCES
Douglas Britt Aug. 1981 117 p refs Workshop held in Carmel, Calif., 26-29 Oct. 1980 Sponsored by Electric Power Research Inst.
(EPRI Proj. 1822-1)
(DE81-904201; EPRI-EA-1988) Avail: NTIS HC A06/MF A01

The purpose of the workshop was to suggest a research program responsive to the needs of the electric utility industry. The workshop participants recommended a broad, conceptual framework for the development of a toxic substances subprogram within the ecological studies program. Futhermore, several guiding principals were suggested for the proposed subprogram, and a variety of specific research areas was identified and ranked for future implementation by EPRI. DOE

N82-10588# California Univ., Berkeley. Lawrence Berkeley Lab.
ASSESSMENT OF OPTIMUM AQUATIC MICROCOSM DESIGN FOR POLLUTION IMPACT STUDIES Final Report
J. Harte, D. Levy, J. Rees, and E. Saegebarth Aug. 1981 179 p refs Sponsored in part by Electric Power Research Inst.
(Contract W-7405-eng-48; EPRI Proj. 1224-1)
(DE81-030674; EPRI-EA-1989) Avail: NTIS HC A09/MF A01

A number of different pelagic microcosm configurations were studied, including the size of the microcosm containers, the method of algal surfacegrowth prevention, and the degree of water mixing and aeration. In addition, the microcosm-lake comparisons were carried out in various seasons of the years to determine the influence of natural seasonal factors on the chemical and biological differences between the lakes and microcosms. In all but the smallest microcosms, surface-growth prevention removed size dependence. Chemical nutrients tracked well except during periods when nutrient inputs to the lake from the surrounding watershed were high. Good tracking of phytoplankton succession patterns was observed only when the physical conditions of the lake matched well with those in the laboratory system. In the decomposition studies, additions of dead organic matter to the lake microcosms were made, and the subsequent response of mineralization activity was measured. It was concluded that appropriate applications of pelagic microcosms are limited, and those applications that are most appropriate are delineated. DOE

N82-10589# National Oceanic and Atmospheric Administration, Oak Ridge, Tenn. Atmospheric Turbulences and Diffusion Lab.
HANDBOOK ON ATMOSPHERIC DIFFUSION MODELS
S. R. Hanna 5 Mar. 1981 72 p refs Sponsored by DOE
(DE81-030474; ATDL-81/5) Avail: NTIS HC A04/MF A01

Models that are widely used for regulatory purposes were reviewed. It is found that the Gaussian plume model is most often used in western countries, while the gradient-transport (K) model is most often used in eastern countries. The most important parameters predicted by the models are the magnitude and location of maximum round level concentrations. The models are compared theoretically and empirically using observations, with the conclusion that maximum concentrations predicted by the two models can differ by an order of magnitude, with the sign of the difference depending on the specific application. DOE

N82-10590# Argonne National Lab., Ill.
STUDIES OF THE REGENERATION OF ACTIVATED BAUXITE USED AS GRANULAR SORBENT FOR THE CONTROL OF ALKALI VAPORS FROM HOT FLUE GAS OF COAL COMBUSTION
S. H. D. Lee, S. D. Smith, W. M. Swift, and Irving Johnson May 1981 51 p refs
(Contract W-31-109-eng-38)
(DE81-030192; ANL/CEN/FE-81-1) Avail: NTIS HC A04/MF A01

Regeneration of activated bauxite by water leaching and thermal swing method was studied. It was found that granular activated bauxite was very effective when used as a filter medium in granular bed filters to remove gaseous alkali metal compounds from simulated hot flue gas of PFBC. Activated bauxite that captured alkali chloride vapors easily and effectively regenerated for reuse by a simple water leaching method. Data were obtained on: (1) the leaching rate of the absorbed NaCl: (2) effects on the leaching rate of absorbed NaCl loading, leaching temperature, and the amount of water; and (3) water retention in activated bauxite after leaching. Physical changes and particle attrition of activated bauxite resulting from regeneration are discussed. The sorption mechanisms of activated bauxite toward alkali chloride vapors are interpreted. DOE

N82-10591# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
INEL GOETHERMAL ENVIRONMENTAL PROGRAM Annual Report, 1980
L. S. Cahn, T. L. Thurow, and J. A. Martinez Apr. 1981 73 p refs
(Contract DE-AC07-76ID-01570)
(DE81-025671; EGG-2113) Avail: NTIS HC A04/MF A01

An overview of continuing environmental research and monitoring programs conducted at the Raft River Geothermal Site is provided. The monitoring programs are designed to collect data on the physical, biological and human environments of the development area. Primary research during 1980 emphasized completing baseline studies on terrestrial fauna, establishing an air quality monitoring network, investigating potential sources of fluoride in the Raft River valley, and studying water level changes in the shallow monitor wells in response to development of the geothermal resource. DOE

N82-10592# Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
EFFECTS OF ATMOSPHERIC VARIABILITY ON ENERGY UTILIZATION AND CONSERVATION Progress Report, 1 Jan. - 30 Jun. 1981
Elmar R. Reiter, C. C. Burns, H. Cochrane, G. R. Johnson, H. Leong, and J. D. Sheaffer Jul. 1981 99 p refs
(Contract DE-AS02-76EV-01340)
(DE81-026308; DOE/EV-01340/1) Avail: NTIS HC A05/MF A01

The research was focused on four major tasks: planetary wave variability and climate fluctuations; regional energy demand modelling; energy demand modelling for air conditioning; and economic factors in climate-sensitive space-conditioning systems design. Efforts in each of these areas are outlined and described in detail. Predicting the impact of climate variability on energy utilization involves understanding both the mechanisms underlying atmospheric variability and the response of energy demand systems to atmospheric variations. Summary descriptions of significant progress in both areas are presented. DOE

N82-10593# Florida Univ., Gainesville. Center for Wetlands.
MODELS OF CARBON FLOW IN TROPICAL ECOSYSTEMS WITH EMPHASIS ON THEIR ROLES IN THE GLOBAL CARBON CYCLE Final Report, 15 Sep. 1978 - 14 Sep. 1980
Sandra Brown, ed. and Ariel E. Lugo, ed. 1980 123 p refs
(Contract DE-AS05-78EV-06047)
(DE81-027999; DOE/EV-06047/1) Avail: NTIS HC A06/MF A01

The role of tropical forests in the carbon balance of the world was studied. Four different approaches were proceded: (1) to quantify the area of tropical forests and the changes in forest cover; (2) to calculate the storage and production of organic carbon in tropical forests; (3) the modelling of land use changes in tropical countries using computer simulation models; and

(4) the synthesis of information from may sources into conceptual schemes using life zone and energy use concepts. DOE

N82-10594# Hart (Fred C.) Associates, Inc., New York, N.Y.
METHODOLOGY FOR DETERMINING THE IMPACT OF ENVIRONMENTAL REGULATORY PROGRAMS Final Report
B. T. Delaney, D. D. Roderique, and T. S. Sekulic May 1981 165 p refs Sponsored by Electric Power Research Inst.
(DE81-903429; EPRI-CS-1834; TPS-79-743) Avail: NTIS HC A08/MF A01

Major federal environmental legislation and regulatory programs affecting the management of air, water, land and solid waste were reviewed. Existing and future environmental regulatory programs and their potential impact on the development and commercialization of advanced, coal-based energy conversion systems are examined. It is determined that the analysis and interpretation of technical information and data collected can be directed towards the development of a methodology by which environmental impacts are systematically reviewed and problem areas identified. DOE

N82-10595# Wisconsin Univ., Milwaukee. Dept. of Physics.
COMPOUND IDENTIFICATION OF ATMOSPHERIC PARTICLES Final Report
D. Lichtman Oct. 1980 35 p
(EPRI Proj. 1310)
(EPRI-EA-1595) Avail: NTIS HC A03/MF A01

The usefulness of several modern surface analytic techniques for compound identification of atmospheric particles with emphasis on sulfur species was tested. Morphology and bulk elemental composition measurements of individual particles were obtained. Electron spectroscopy for chemical analysis was used to obtain sulfur peaks for all the compounds used in the auger electron spectroscopy calibration, enabling the correlation of information with that obtained with the high spatial resolution scanning Auger system. It is indicated that a combination of techniques can be used successfully for compound identification of individual particles. DOE

N82-10596# California Energy Commission, Sacramento.
PROPOSED RESIDENTIAL BUILDING STANDARDS: DRAFT ENVIRONMENTAL IMPACT REPORT
Mar. 1981 231 p refs
(P-700-80-013) Avail: NTIS HC A11/MF A01

The Warren-Alquist Act of 1974 requires the California Energy Commission to adopt and periodically update energy-conservation standards for new residential buildings. The Act also requires the CEC to adopt performance standards for new buildings. With increased energy costs, the CEC staff proposed to update the current energy-conservation standards and they are a hybrid of performance and prescriptive requirements. The proposed standards do not cover hotels, motels, or buildings over 3 stories high. The purpose of an environmental impact report (EIR) is to provide public agencies and the public in general with detailed information about the effects a proposed project is likely to have on the environment, to list ways in which the significant effects of such a project might be minimized, and to indicate alternatives to the project. DOE

N82-10597# California Univ., Livermore. Lawrence Livermore Lab.
ELECTROSTATIC AIR FILTERS GENERATED BY ELECTRIC FIELDS
W. Bergman, A. H. Biermann, H. D. Hebard, B. Y. Lum, and W. D. Kuhl 27 Jan. 1981 38 p refs Presented at the Ann. Meeting of the Fine Particle Soc., Washington, D.C., 16-18 Sep. 1980
(Contract W-7405-eng-48)
(DE81-023658; UCRL-84878; CONF-800953-2) Avail: NTIS HC A03/MF A01

Fibrous filters converted to electrostatic operation by a nonionizing electric field were investigated. It was shown that static filter has a higher efficiency and a longer, more useful life. The filter's increased efficiency is attributed to a time independent attraction between polarized fibers and charged, polarized particles and a time dependent attraction between charged fibers and charged, polarized particles. It is concluded that the charge on the fibers results from a dynamic process of charge accumulation due to the particle deposits and a charge dissipation due to the fiber conductivity. DOE

N82-10598# Argonne National Lab., Ill.
ECONOMIC AND ENVIRONMENTAL TRADEOFFS IN COAL CONVERSION
C. D. Livengood, H. S. Huang, and P. S. Farber 1980 20 p refs Presented at the Ann. Meeting of the Air Pollution Control Assoc., Montreal, 22-27 Jun 1980
(Contract W-31-109-eng-38)
(CONF-800608-8) Avail: NTIS HC A02/MF A01

The costs of environmental control systems and the difficulties of solid waste disposal are discussed. Unless significant cost breakthroughs are achieved, SRC-1 does not appear economically competitive for new large power plants. The use of SRC is favored in plants converting from oil. The recent increased interest in reducing emissions from existing coal fired plants as a control measure for acid rain could open up a significant new market for highly processed coal such as SRC-1. DOE

N82-10599# ECP, Inc., El Segundo, Calif.
CRYSTALLIZED FLY-ASH FEASIBILITY STUDY Final Report
May 1981 78 p refs Sponsored in part by Electric Power Research Inst.
(EPRI Proj. 1210-1)
(EPRI-EL-1836) Avail: NTIS HC A05/MF A01

A study to determine the feasibility for production and use of crystallized fly ash is presented. The raw materials (fly ash, fluxing, nucleating and crystallizing agents), molten state and crystallization analysis and characterization of crystallized fly ash are discussed in detail. The development of the process along with the structural and insulation characteristics of the crystallized fly ash as a mechanical support element for electrical conductors are also described in detail. DOE

N82-10600# Oak Ridge National Lab., Tenn. Health and Safety Research Div.
DEVELOPMENT AND APPLICATION OF TERRESTRIAL FOOD CHAIN MODELS TO ASSESS HEALTH RISKS TO MAN AND RELEASES OF POLLUTANTS TO THE ENVIRONMENT
Stephen V. Kaye, F. Owen Hoffman, Laura M. McDowell-Boyer, and C. Fred Baes 1981 39 p refs Presented at the Intern. Symp. on Health Impacts of Different Sources of Energy, Nashville, Tenn., 22 Jun. 1981
(Contract W-7405-eng-26)
(DE81-024127; IAEA-SM-254/63; CONF-810652-4) Avail: NTIS HC A03/MF A01

The application of mathematical models to predict the terrestrial food chain transport of pollutants of potential importance to human health are discussed. The strengths and weaknesses of these models are related to the needs of the model user, the availability of relevant data for parameter quantification, and the feasibility for model validation. The optimum level of simplification, however, is determined by model validation results and the use of model implementation. Most examples are derived from models used to assess the terrestrial food chain transport of radionuclides. It is concluded that current limitations in parameter quantification and model validation will restrict most assessment applications of terrestrial food chain models to a type of screening calculation. DOE

N82-10601# Harvard Univ., Cambridge, Mass. School of Government.
RELAXING ENVIRONMENTAL STANDARDS DURING OIL-SUPPLY DISRUPTIONS: PAST, PRESENT AND FUTURE M.A. Thesis
Thomas Hansen Birdsall 13 Apr. 1981 132 p refs
(Contract DE-AC01-80PE-70278)
(DE81-024250; DOE/PE-70278/T15) Avail: NTIS HC A01/MF A01

Relaxation of environmental standards during oil supply disruptions were examined. The following two policy questions are addressed: (1) should environmental standards such as sulfur emissions limitations be relaxed during oil supply disruptions; and (2) if relaxing a particular standard appears desirable, when,

where and how should it be relaxed. It is argued that disruptions could suddenly result in marginal pollution abatement costs much greater than the benefits from, or demand for, the marginal improvement in air quality from such abatement, justifying temporary variances. A set of criteria for evaluating variance policies are developed on the basis of both the theoretical rationale for variances and institutional or implementation considerations. Present federal variance policy are described and the criteria are used to evaluate current policy. DOE

N82-10602# Research Inst. of National Defence, Umea (Sweden). Huvudavdelning 4.

AEROSOLS AND RELATIVE HUMIDITY. STATE OF THE ART REPORT [AEROSOLER OCH RELATIV LUFTFUKTIGHET]

Mats S. Ahlberg and Jan Bylund Dec. 1980 12 p In SWEDISH

(Grant Dnr-79/137)

(FOA-C-40127-H2) Avail: NTIS HC A02/MF A01

A system for producing humid air is described along with a circulation drier, to dry the humid air. The system was tested on a welding smoke aerosol. A modification of shape of the welding smoke particles, from a chain connection to a sphere-shaped agglomerate, as a consequence of humidifying them followed by drying is reported with the aid of a transmission electron microscope. Author (ESA)

N82-10603# Technical Research Centre of Finland, Helsinki. Nuclear Engineering Lab.

ARANO: A COMPUTER PROGRAM FOR THE ASSESSMENT OF RADIOLOGICAL CONSEQUENCES OF ATMOSPHERIC RADIOACTIVE RELEASES

Ikka Savolainen and Serpo Vuori Sep. 1980 59 p refs

(VTT-53; ISBN-951-38-1061-5; ISSN-0355-3698) Avail: NTIS HC A04/MF A01

Results include individual doses for different organs at given distances from the release point, collective doses, numbers of casualties, area polluted by deposited activity, and loss of investment or production due to radioactive contamination. Cases of a single release and atmospheric dispersion, and of a group of radioactive releases and dispersion with discrete probability distributions, can be considered. If these releases of dispersion conditions are expressed by probability distributions, the magnitudes of specified effects, and their expectation values and cumulative probability distributions, can be assessed.

Author (ESA)

N82-10604# Transportation Research Board, Washington, D.C.

ENVIRONMENTAL ISSUES IN TRANSPORTATION: ANALYSIS, NOISE, AND AIR QUALITY

Louis F. Cohn, Gerardo G. Clemena, Kenneth R. Agent, jerry A. Reagan, Glenda J. Sisson, William Bowlby, Louis F. Cohn, Leonard W. Casson, David I. Cook, Andrew N. Barrass et al 1981 63 p refs

(PB81-215261; TRB/TRR-789; ISBN-0-309-03203-2; ISSN-0361-1981; LC-81-9592) Avail: NTIS HC A04/MF A01 CSCL 13F

The following areas were examined: evolution of environmental analysis at the state transportation department level; empirical relationship between mesoscale carbon monoxide concentrations and areal vehicular emission rates; evaluation of the federal highway administration procedure for highway traffic noise prediction; comparison of Leq(h) and Ldn as descriptors of highway traffic noise; role of plant materials in traffic noise control; noise abatement and public policy decisions: a case study -1-440 in Nashville; and inventory and priority rating of potential type II noise-abatement sites in Georgia. A simplified traffic-noise-prediction model for transportation and land use planning is presented. GRA

N82-10605# Harvard Univ., Cambridge, Mass. School of Government.

CASE STUDIES IN THE APPLICATION OF AIR QUALITY MODELLING IN ENVIRONMENTAL DECISION MAKING: SUMMARY AND RECOMMENDATIONS

Catherine G. Miller May 1981 92 p refs

(Grant EPA-R-805558-01)

(PB81-213233; EPA-600/4-01-034) Avail: NTIS HC A05/MF A01 CSCL 13B

The application of air quality models to examine the problems encountered when trying to use these models in makin environmental policy decisions was undertaken. It is shown that technical and political constraints exist but that unresolved policy issues, the management of the decision process and conflicting institutional and organizational interests also cause problems. Reommendations are made on how to improve the technical planning and management of the decision process so that the air quality models can become a better policy tool within the state of the art, political and organizational constraints. GRA

N82-10606# Moulton Niguel Water District, Laguna Niguel, Calif.

WASTEWATER TREATMENT BY ROOTED AQUATIC PLANTS IN SAND AND GRAVEL TRENCHES Final Report, Aug. 1977 - Aug. 1979

Pamela R. Pope Jun. 1981 31 p

(Grant EPA-R-805279)

(PB81-213241; EPA-600/2-81-091) Avail: NTIS HC A03/MF A01 CSCL 13B

A process for the treatment of industrial wastes, an energy efficient method for the treatment of municipal wastewater was evaluated. This biological treatment process uses a minimal amount of mechanical equipment and does not require a great amount of manpower for normal operation. It is demonstrated that raw screened wastewater applied to the trench system at a rate not exceeding 95 cu m/d can be treated to secondary effluent quality. Spatial requirements were the same as for a septic tank system. GRA

N82-10607# FMC Corp., Englewood, Colo.

FEASIBILITY STUDY OF OPEN TANK OXYGEN-ACTIVATED SLUDGE WASTEWATER TREATMENT Final Report, May 1973 - Oct. 1974

Kerwin R. Rakness Jun. 1981 65 p refs

(Grant EPA-S-801790)

(PB81-213274; EPA-600/2-81-095) Avail: NTIS HC A04/MF A01 CSCL 13B

A pilot plant consisting of one oxygenation basin and two clarifiers treated primary clarifier effluent from the Englewood, Colorado, treatment facility. The influent flow rate was adjusted to attain average aeration reactor detention times ranging from 0.94 to 3.3 hr. The pilot plant operation was conducted in two phases. Treatment performance during both phases was excellent. Final effluent BOD5 concentration and secondary BOD5 removals averaged less than 20 mg/l and greater than 90 percent, respectively. Analysis of pilot plant operations indicated that somewhat less sludge was produced with the oxygen system when compared to literature-cited, typical air sludge production. This decreased sludge production occurred and became more pronounced at higher organic loadings. GRA

N82-10608# Geological Survey, Champaign, Ill.

COAL FLY ASH: A REVIEW OF THE LITERATURE AND PROPOSED CLASSIFICATION SYSTEM WITH EMPHASIS ON ENVIRONMENTAL IMPACTS

William R. Roy, Richard G. Thiery (Illinois State Natural History Survey), Rudolph M. Schuller, and John J. Suloway (Illinois State Natural History Survey) Apr. 1981 75 p refs

(PB81-215014; IL/SGS/EGN-96) Avail: NTIS HC A04/MF A01 CSCL 13B

The scientific literature on fly ash generated by coal burning power plants cites is reported. General conclusions are formulated, on the basis of data compiled from this review, on the physiochemical characteristics of the solid waste and the possible environmental impacts of its disposal. GRA

N82-10609# Environmental Protection Systems, Inc., Jackson, Miss.

FACULTATIVE LAGOON EFFLUENT POLISHING USING PHASE ISOLATION PONDS Final Report, Sep. 1977 - Sep. 1980

E. Corbin McGriff, Jr. May 1981 168 p refs

(Grant EPA-R-805296)

(PB81-205965; EPA-600/2-81-084) Avail: NTIS HC A08/MF A01 CSCL 13B

An investigation into the performance of phase isolation was

conducted using 2 facultative lagoons arranged in series followed by 2 isolation ponds used alternately for final polishing. The isolation ponds were operated on a fill and draw basis with isolation periods varying from 20-44 days. GRA

N82-10610 State Univ. of New York Coll. of Environmental Science and Forestry, Syracuse.
THE DISTRIBUTION OF HEAVY METALS AND PETROLEUM RESIDUES IN THE SOIL FROM URBAN SURFACE RUNOFF Ph.D. Thesis
Manfred Owe 1981 193 p
Avail: Univ. Microfilms Order No. 8118121

The profiles of two common soils, a sandy, porous Arkport and a dense, clayey Dunkirk, were reconstructed in 14 cm by 80 cm columns in the laboratory. The design was intended to simulate a collection basin, one fourth the surface area of the test basin. Surface runoff was sampled and collected from a heavily used shopping center parking lot. The profiles were subsequently analyzed at predetermined increments for zinc, lead, cadmium, copper and petroleum residues. An overall increase in total cation and petroleum concentration was noticed with an increase in treatment concentration. A positive relationship between contaminant concentration in the soil and treatment level, exchange capacity, final soil pH and percent organic matter was realized. A negative correlation was noticed between contaminant concentration and bulk density. Treatment level and final soil pH experienced a strong negative correlation.
Dissert. Abstr.

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation*.

N82-10611 Indiana Univ., Indianapolis.
SAND ENCROACHMENT BY WIND IN AL-HASA OF SAUDI ARABIA Ph.D. Thesis
Yahya Mohammed Sheikh Abolkhair 1981 214 p
Avail: Univ. Microfilms Order No. 8118015

Sand drift and sand dune movement rates in the study area are controlled by several major factors. These factors in descending order of importance are: wind characteristics (velocity, duration, and direction), mean sand grain size, dune size, sand volume available for transport, moisture content of the sand and density of vegetal cover. The objective of this study was to determine the rate of sand drift and sand dune movement as it is related to wind characteristics and mean sand grain size. Equipment to record wind characteristics was installed in the al-Hasa dune field during the period between February and June of 1980. Sand traps to measure the volume of sand moved and the direction from which it moved during this period were also installed at the project site. Sand caught in the various traps was analyzed and its statistical parameters such as the mean, sorting, skewness and kurtosis were determined. Rates of sand dune movement were determined. Dissert. Abstr.

N82-10612 Texas Univ. at Dallas.
A CRUSTAL SECTION OF NORTHERN CENTRAL AMERICA AS INFERRED FROM WIDE ANGLE REFLECTIONS FROM SHALLOW EARTHQUAKES Ph.D. Thesis
Jung Joon Kim 1981 111 p
Avail: Univ. Microfilms Order No. 8118228

A three-layered crustal structure for a portion of northern Central America is derived using both travel time and amplitude data from seismograms recorded at Tegucigalpa, Honduras. The sources are shallow earthquakes that occurred along the Motagua fault in Guatemala 200 to 450 km (25-50 seconds in terms of S-P time) from the station. Since ray paths are almost parallel to the axis of the Middle America trench, approximately 250 km away, a homogeneous, horizontally layered crust may be reasonably assumed. At this distance range, which is far beyond critical distance for reflections from within the crust, shallow sources always generate a small first arrival followed by several large later arrivals. The first arrival is interpreted as Pn (the head wave from the Mohorovicic discontinuity) and the later arrivals are interpreted as wide angle (over-critical) reflections from layer boundaries. Three wide angle reflections (PmP, PiP, and PgP) are identified. Dissert. Abstr.

N82-10613 State Univ. of New York at Stony Brook.
AN APPLICATION OF THE TWO EDDY HYPOTHESIS TO THE GENERAL CIRCULATION OF THE ATMOSPHERE Ph.D. Thesis
Babu R. Bangaru 1980 85 p
Avail: Univ. Microfilms Order No. 8119629

A statistical dynamical model to the problem of general circulation of the Earth's atmosphere is developed using vorticity as a transferable flow property instead of momentum. Two types of eddies are used to explain the overall up-gradient transfer of vorticity at certain latitudes and down-gradient at others. By the use of Proudman-Taylor theorem generalized to rotating baroclinic quasi-geostrophic fluid the model is greatly simplified. To examine the validity of the two eddy hypothesis and that of vorticity as a transferable flow property a simplified version of the model is solved numerically for a zonally symmetric atmosphere. The distributions of wind, temperature, heat flux, and angular momentum flux are in tolerable agreement with the observed data in spite of the simplifications used.
Dissert. Abstr.

N82-10614 Massachusetts Univ., Boston.
STRATIGRAPHY, STRUCTURAL GEOLOGY, AND PETROLOGY OF BEDROCK ALONG THE ADIRONDACK HIGHLANDS. NORTHWEST LOWLANDS BOUNDARY HARRISVILLE, NEW YORK Ph.D. Thesis
Richard Witt Wiener 1981 144 p
Avail: Univ. Microfilms Order No. 8118052

Detailed geologic mapping and analysis of minor structural features in the eastern portion of the Harrisville and western portion of the Fine 7 1/2' quadrangles reveals that the boundary between the Adirondack Highlands and Northwest Lowlands is a multiply folded intrusive contact between metamorphosed sedimentary rocks of the Lowlands and metamorphosed intrusive rocks of the Diana Complex in the Highlands. Furthermore, protomylonitic foliation in quartz syenite gneiss of the Diana Complex is an axial plane foliation formed by isoclinal folding of dry quartz syenite at granulite facies metamorphic grade. The lack of major post-intrusive fault displacement along the Diana Complex-Northwest Lowlands Boundary is demonstrated by correlation of xenoliths in the Diana Complex with immediately adjacent metamorphosed sedimentary rock units of the Northwest Lowlands. Dissert. Abstr.

N82-10615 Wisconsin Univ. - Madison.
PALEOGEOGRAPHY, DEPOSITIONAL HISTORY AND CONODONT PALEOECOLOGY OF THE LOWER TRIASSIC THAYNES FORMATION IN THE CORDILLERAN MIOGEOSYNCLINE Ph.D. Thesis
Timothy Robert Carr 1981 227 p
Avail: Univ. Microfilms Order No. 8116641

The Lower Triassic Thaynes Formation was studied at ten localities in Utah, eastern Nevada, southeastern Idaho, western Wyoming, and southwestern Montana. The Thaynes Formation records the final episode of marine sedimentation in the Cordilleran miogeosyncline. The strata display a depositional and structural pattern persistent from the late Paleozoic and possibly the late Precambrian. A basin-wide conodont zonation is proposed and is based on the stratigraphic distribution of 34 form elements referable to 17 single element species. The improved conodont based time-stratigraphic correlations permit recognition of facies patterns for restricted time-rock units and subsequent discrimination of persistent paleographic and paleotectonic features. Association and similarity analysis are used to cluster Smithian conodont elements into eight entities, reflecting both biologic association (multielement apparatuses) and ecologic association (biofacies). Examination of contingency tables and discriminant analysis reveal the presence of three distinctive conodont biotopes arranged along a generalized depth-related environmental gradient. Dissert. Abstr.

N82-10616 Virginia Polytechnic Inst. and State Univ., Blacksburg.
EROSIONAL HISTORY OF THE NEW RIVER, SOUTHERN

APPALACHIANS, VIRGINIA Ph.D. Thesis
Brenda Houser 1980 309 p
Avail: Univ. Microfilms Order No. 8118697

The data derived from mapping the surficial geology (particularly alluvial deposits), in conjunction with other field observations and with heavy-mineral analyses, are interpreted in terms of provenance, depositional environment (or accumulation), and preservation of the surficial deposits. In addition, these data are applied to an interpretation of the evolution of the New River drainage in the Valley and Ridge Province during the latter half of the Neogene. The areal distribution of the surficial materials indicates that in a humid, temperature climate deposits of surficial materials tend to be preserved if they overlie carbonate bedrock which weathers chemically but tend to be eroded from shale and sandstone bedrock which weathers mechanically. In carbonate terrains where surface runoff is minimal, surficial materials are let down in place by solution and have been accumulating in a piecemeal fashion over a time period which in some areas may include all Cenozoic time. The areal distribution and lithology of alluvial deposits provide evidence which can be used to reconstruct the late Cenozoic evolution of part of the New River drainage system within the Valley and Ridge Province. Dissert. Abstr.

N82-10617 Massachusetts Univ., Boston.
BRITTLE FRACTURE HISTORY OF THE NARRAGANSETT PIER GRANITE, RHODE ISLAND Ph.D. Thesis
Michael Jacob Hozik 1981 321 p
Avail: Univ. Microfilms Order No. 8118007

The Narragansett Pier Granite, which underlies the southern coast of Rhode Island, was studied for its brittle fracture. It is suggested that the pluton does not extend far offshore to the east or south and that the remaining onshore body of granite is only a few kilometers thick. Foliation data in the granite and surrounding rocks, in conjunction with metamorphic isograds in the Narragansett Basin suggests that the granite intruded parallel to the generally east west foliation in the surrounding rocks, probably at moderate to shallow depths. The stresses induced by the change in spreading direction is in agreement with the stress inferred from an east west set of late dip slip faults in the narragansett domain, and with a set of younger stresses. The youngest features in the Narragansett Pier Granite are common joints, microjoints, and zones of microjoints. It is noted that most of these elements formed under a different stress system from the faults. It is suggested that the development of rift and grain represents the result of an additional process or event not recorded by other fracture elements. Dissert. Abstr.

N82-10618 Idaho Univ., Moscow.
GEOLOGY AND LINEARS OF LIBYA Ph.D. Thesis
Milud Abdulkrim Mansur 1981 276 p
Avail: Univ. Microfilms Order No. 8119882

The geology of Libya is described in detail with some reference to economic resources. An analysis of LANDSAT space photographs revealed about 2,000 linears, unequally distributed in the different parts of the country, and characterized by considerable variations in their length, strike, and density. Some of them coincide with known structural features including fault scarps, topographic features, dikes, alignments of igneous bodies, and straight drainage systems. Dissert. Abstr.

N82-10619 Colorado State Univ., Fort Collins.
JURASSIC DEPOSITIONAL HISTORY AND VANADIUM-URANIUM DEPOSITS, SLICK ROCK DISTRICT, COLORADO PLATEAU Ph.D. Thesis
Noel Tyler 1981 285 p
Avail: Univ. Microfilms Order No. 8119737

The Jurassic interval studied in the Slick Rock vanadium-uranium district consists of the upper units of the San Rafael group (the Summerville formation and the Junction Creek sandstone) and the Tidwell and Salt Wash members of the Morrison formation. The dominantly argillaceous Summerville formation is interpreted as a lacustrine deposit. A salt cast-bearing seven meter thick arenite sequence in the central portions of the Summerville assemblage is inferred to have been deposited in the nearshore and evaporative foreshore setting during a major lacustrine regression. As the Summerville lake dried up, sand dunes migrated across the lacustrine plain. These are now preserved as the eolian Junction Creek sandstone in the southern part of the study area. Dissert. Abstr.

N82-10620 Emory Univ., Atlanta, Ga.
LABORATORY MEASUREMENTS OF RATE CONSTANTS OF SELECTED BROMINE REACTIONS OF STRATOSPHERIC INTEREST Ph.D. Thesis
Jessica Dee Posey 1980 123 p
Avail: Univ. Microfilms Order No. 8119154

Some bromine reactions of stratospheric interest were examined. The kinetics of several bromine reactions were studied at 298 K using a fast flow reactor coupled to a molecular beam mass spectrometer. Selected chlorine analogs of several of the bromine reactions were also examined to check the method of experimentation. Dissert. Abstr.

N82-10621 Institut d'Aeronomie Spatiale de Belgique, Brussels.
FLUCTUATIONS, SOLAR PERIODICITIES, AND CLIMATIC TRANSITIONS
C. Nicolis 1980 26 p refs Presented at CNES Intern. Conf. on Sun and Climate, Toulouse, 30 Sep. - 3 Oct. 1980
(Aeronomica-Acta-A-225-1980) Avail: Issuing Activity

The time dependent properties of a zero dimensional climatic model, showing-bistable behavior and subject both to internal fluctuations and to an external periodic forcing, are analyzed. Conditions under which the deterministic response of the system is amplified are found analytically. The results are illustrated by numerical simulations. R.C.T.

N82-10622 Institut d'Aeronomie Spatiale de Belgique, Brussels.
CHEMICAL RESPONSE OF THE MIDDLE ATMOSPHERE TO SOLAR VARIATIONS
P. DeBaets, G. Brasseur, and P. C. Simon 1980 14 p refs Presented at 14th ESLAB Symp. on Physics of Solar Variations, Scheveningen, Netherlands, 16-19 Sep. 1980 Submitted for publication
(Aeronomica-Acta-A-224-1980) Avail: Issuing Activity

The possible variation of the trace species concentration in the middle atmosphere, related to long-term solar irradiance variability, is estimated by means of a one dimensional numerical model. The spectral variation of the solar irradiance over the 11 year cycle is discussed. The ratio of irradiance at high and low solar activity conditions is on the order of 2.8 at Lyman alpha (121.6 nm) and decreases with wavelength to reach about 1.2 at 185 nm. The one dimensional model extends from the ground to an altitude of 100 km. A standard chemical scheme, including the odd oxygen, hydrogen, nitrogen, and chlorine species, is used, but no temperature feedback is considered. Calculation results assume constant thermal and dynamic, averaged conditions. It is suggested that the introduction of temperature and transport feedback could considerably modify the values presented. Author (ESA)

N82-10623*# Ohio State Univ., Columbus. Dept. of Geodetic Science and Surveying.
BASIC RESEARCH FOR THE EARTH DYNAMICS PROGRAM Semiannual Status Report, 1 Apr. - 30 Sep. 1981
Oct. 1981 105 p refs
(Contract NAS5-25888)
(NASA-CR-164902; SASR-7; SASR-4) Avail: NTIS HC A06/MF A01 CSCL 08G

The technique of range differencing with Lageos ranges to obtain more accurate estimates of baseline lengths and polar motion variation was studied. Differencing quasi simultaneous range observations eliminate a great deal of orbital biases. Progress is reported on the definition and maintenance of a conventional terrestrial reference system. E.A.K.

N82-10624*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
OZONE TREND DETECTABILITY
Janet W. Campbell, ed. Jul. 1981 108 p refs Proc. of Symp. held at Boulder, Colo., 28-29 Jul. 1977
(NASA-CP-2189; L-14654) Avail: NTIS HC A06/MF A01 CSCL 04A

The detection of anthropogenic disturbances in the Earth's ozone layer was studied. Two topics were addressed: (1) the level at which a trend in total ozoning is detected by existing

data sources; and (2) empirical evidence in the prediction of the depletion in total ozone. Error sources are identified. The predictability of climatological series, whether empirical models can be trusted, and how errors in the Dobson total ozone data impact trend detectability, are discussed. For individual titles, see N82-10625 through N82-10628.

N82-10625*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
THE NATURE OF THE DATA
In its Ozone Trend Detectability Jul. 1981 p 8-94 (For primary document see N82-10624 01-46)
Avail: NTIS HC A06/MF A01 CSCL 04A

The locations of total ozone stations and of stratospheric ozone samplings were presented. The samplings are concentrated in three areas: Japan, Europe, and India. Approximately 75% of the total ozone measurements are made with Dobson instruments which offer the best international measurements. When well calibrated their accuracy is on the order of a few percent. It is found that although the total ozone percent is similar in both hemispheres, the Northern Hemisphere has 3 to 10% more ozone than the southern hemisphere. The close association between total ozone distribution and pressure distribution in the atmosphere is noted. E.A.K.

N82-10626*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ESTIMATION OF TRENDS
In its Ozone Trend Detectability Jul. 1981 p 35-66 (For primary document see N82-10624 01-46)
Avail: NTIS HC A06/MF A01 CSCL 04A

The application of statistical methods to recorded ozone measurements. The effects of a long term depletion of ozone at magnitudes predicted by the NAS is harmful to most forms of life. Empirical prewhitening filters the derivation of which is independent of the underlying physical mechanisms were analyzed. Statistical analysis performs a checks and balances effort. Time series filters variations into systematic and random parts, errors are uncorrelated, and significant phase lag dependencies are identified. The use of time series modeling to enhance the capability of detecting trends is discussed. E.A.K.

N82-10627*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
FORUM FOR DISCUSSION AND DEBATE
In its Ozone Trend Detectability Jul. 1981 p 67-91 refs (For primary document see N82-10624 01-46)
Avail: NTIS HC A06/MF A01 CSCL 04A

The application of statistical methods to meteorological data for which there are long, compatible series, and where known trend changes took place were suggested. The effects of optical wedge deterioration, atmospheric aerosol variation, solar irradiance variations, etc., are evaluated. It is recommended that coupled satellite ground based observational system is required to determine global long term trends. E.A.K.

N82-10628*# Control Data Corp., Minneapolis, Minn.
TOTAL OZONE TREND SIGNIFICANCE FROM SPACE TIME VARIABILITY OF DAILY DOBSON DATA
Robert W. Wilcox *In* NASA. Langley Research Center Ozone Trend Detection Jul. 1981 p 93-104 refs (For primary document see N82-10624 01-46)
Avail: NTIS HC A06/MF A01 CSCL 04A

Estimates of standard errors of total ozone time and area means, as derived from ozone's natural temporal and spatial variability and autocorrelation in middle latitudes determined from daily Dobson data are presented. Assessing the significance of apparent total ozone trends is equivalent to assessing the standard error of the means. Standard errors of time averages depend on the temporal variability and correlation of the averaged parameter. Trend detectability is discussed, both for the present network and for satellite measurements. E.A.K.

N82-10629*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A MULTILAYER MODEL OF TIME DEPENDENT DEFORMATION FOLLOWING AN EARTHQUAKE ON A STRIKE-SLIP FAULT
Steven C. Cohen Aug. 1981 33 p refs Submitted for publication
(NASA-TM-82174) Avail: NTIS HC A03/MF A01 CSCL 08K

A multilayer model of the Earth to calculate finite element of time dependent deformation and stress following an earthquake on a strike slip fault is discussed. The model involves shear properties of an elastic upper lithosphere, a standard viscoelastic linear solid lower lithosphere, a Maxwell viscoelastic asthenosphere and an elastic mesosphere. Systematic variations of fault and layer depths and comparisons with simpler elastic lithosphere over viscoelastic asthenosphere calculations are analyzed. Both the creep of the lower lithosphere and astenosphere contribute to the postseismic deformation. The magnitude of the deformation is enhanced by a short distance between the bottom of the fault (slip zone) and the top of the creep region but is less sensitive to the thickness of the creeping layer. Postseismic restressing is increased as the lower lithosphere becomes more viscoelastic, but the tendency for the width of the restressed zone to growth with time is retarded. E.A.K.

N82-10630# Honeywell, Inc., Clearwater, Fla.
GEO-SPIN/IPS-2 IMPROVEMENTS FOR PRECISION GRAVITY MEASUREMENT
Gary W. Adams and Michael J. Hadfield 5 Jun. 1981 19 p refs Sponsored by Army
(AD-A103407; ETL-R025) Avail: NTIS HC A02/MF A01 CSCL 17/7

Improved accuracies must be maintained with the system operated along any trajectory in a ground vehicle or helicopter. The most important performance parameter is deflection of the vertical. This paper reports the results of the gravity improvement study. It addresses hardware, software and operational procedure aspects. Supporting data are provided for the assessment of current performance. On-line and off-line data reduction and analysis are considered. The rather interesting application of both Kalman filtering (using data up to a current point) and Kalman smoothing (total traverse data processing) is covered and its effectiveness evaluated with supporting computer simulations for the gravity measurement problem. Use of both ZUPT and control point data is considered in the smoothing process. By-products of gravity measurement accuracy improvement are better positioning performance and operational flexibility. These topics are also touched upon in this paper. Hence, it should be of widespread interest to the surveying and geodesy communities. GRA

N82-10631# Lowell Univ., Mass. Center for Atmospheric Research.
DIGITAL IONOSPHERIC SOUNDING IN THE ARCTIC Final Report, 1 Mar. 1978 - 25 Mar. 1980
B. Reinisch and K. Bibl Hanscom AFB, Mass. AFGL Jan. 1981 134 p refs
(Contract F19628-78-C-0085; AF Proj. 4643)
(AD-A104163; ULRF-412/CAR; AFGL-TR-81-0022) Avail: NTIS HC A07/MF A01 CSCL 04/1

New ionogram observation techniques were applied at the Goose Bay Ionospheric Observatory (GBIO) in Newfoundland, Canada, and aboard AFGL's Airborne Ionospheric Observatory (AIO), using the Digisonde 128PS system. A receiving array of four crossed-loop antennas at GBIO enabled incidence angle and polarization measurements within the ionogram in addition to the Doppler observations. The Doppler information in the propagation ionograms between the GBIO Digisonde and the moving AIO sounder facilitates the interpreting of different modes of propagation. Software for the AFGL CDC 6600 computer and for a microcomputer was developed for the processing of the digital ionograms. The identification of ordinary and extraordinary echoes in the Goose Bay ionograms greatly simplify the automatic processing of ionograms. Indeed, it became clear that for automatic ionogram trace identification the O and X tagging is a prerequisite. In support of the ESD 414L project an ionogram communicator (ICOM) was added to the GBIO Digisonde providing - via telephone lines - realtime ionogram printouts at the Over-The-Horizon Backscatter Experimental Radar System in Maine. Another Digisonde station was equipped and brought to operation in Keflavik, Iceland, to provide environmental data for the OTH radar operation. Author (GRA)

N82-10632# California Univ., Berkeley. Lawrence Berkeley Lab.
SUMMARY OF THE LLNL ONE-DIMENSIONAL TRANSPORT-KINETICS MODEL OF THE TROPOSPHERE AND STRATOSPERE, 1981
D. J. Wuebbles Sep. 1981 29 p refs
(Contract W-7405-eng-48)
(DE81-030480; UCID-19185) Avail: NTIS HC A03/MF A01

The model currently extends from the ground to 56.25 km. The vertical grid structure is variable, but usually has a 0.5 km thick layer at the surface, 1 km thick layers extending from 0.5 to 34.5 km, a 1.75 km thick layer between 34.5 and 36.25, and 2.5 km thick layers extending to 56.25 km. The treatment of all species by the model is described. The transport parameterization is discussed in detail. T.M.

N82-10633# Radiation Research Associates, Inc., Fort Worth, Tex.
STUDY OF THE DISTRIBUTION OF RADON IN THE ATMOSPHERE TO A HEIGHT OF 457 METERS Final Report
C. E. Clifford, R. M. Rubin, and M. B. Wells May 1981 53 p refs
(Contract DE-AC13-76GJ-01664)
(DE81-030293; GJBX-280-81; RRA-T8002) Avail: NTIS HC A04/MF A01

An extensive set of measurements were obtained using alpha-particle detectors of the Track Etch type. These detectors were exposed for periods of approximately three months on four television towers. Radon measurements were also made as a function of ground depth. A statistical F-test analysis of the readings from the exposed Track Etch detectors on the towers leads to the conclusion that the radon concentration in air at each of the tower sites does not vary with height above ground for heights to 457 meters. DOE

N82-10634# Tufts Univ., Medford, Mass. Dept. of Physics.
RADIATION REACTION FORCE AND UNIFICATION OF ELECTROMAGNETIC AND GRAVITATIONAL FIELDS
C. Y. Lo, Gary R. Goldstein, and A. Napier Apr. 1981 26 p refs
(Contract DE-AC02-76ER-03023)
(DE81-029086; DOE/ER-03023/T1) Avail: NTIS HC A03/MF A01

A unified theory of electromagnetic and gravitational fields should modify classical electrodynamics such that the radiation reaction force is accounted for. The analysis leads to a five-dimensional unified theory of five variables. The theory is supported by showing that, for the case of a charged particle moving in a constant magnetic field, the radiation reaction force is indeed included. Moreover, this example shows explicitly that physical changes are associated with the fifth variable. Thus, the notion of a physical five-dimensional space should be taken into consideration. DOE

N82-10635# California Univ., Livermore. Lawrence Livermore Lab.
BLOCK-ADAPTIVE FILTERING AND ITS APPLICATION TO SEISMIC-EVENT DETECTION Ph.D. Thesis
Gregory Alan Clark Apr. 1981 209 p refs
(Contract W-7405-eng-48)
(DE81-028361; UCRL-53147) Avail: NTIS HC A10/MF A01

Block digital filtering involves the calculation of a block or finite set block processing arises from computational advantages of the technique. Block filters take good advantage of parallel processing architectures, which are becoming more and more attractive with the advent of very large scale integrated (VLSI) circuits. The block technique was extended to Wiener and adaptive filters, both of which are statistical filters. The key to this extension is the definition of a new performance index, block mean square error (BMSE), which combines the well known sum square error (SSE) and mean square error. DOE

N82-10636# Kiruna Geophysical Inst. (Sweden).
QUIET TIME CONVECTION ELECTRIC FIELD PROPERTIES DERIVED FROM keV ELECTRON MEASUREMENTS AT THE INNER EDGE OF THE PLASMA SHEET BY MEANS OF GEOS-2
B. Hultqvist, H. Borg, L.-A. Holmgren, H. Reme (Toulouse Univ.), A. Bahnsen (Danish Space Research Inst.), M. Jespersen (Danish Space Research Inst.), and G. Kremser (Max-Planck-Inst. fuer Aeronomie, Katlenburg-Lindau, West Germany) Apr. 1981 54 p refs Submitted for publication
(KGI-Preprint-052; ISSN-0349-2656) Avail: NTIS HC A04/MF A01

An electric field model, with the dusk singular point of the forbidden region boundary at 1500 instead of at 1800 MLT, is in quite good agreement with the observations. Effects due to shielding by the hot plasma of the inner magnetosphere from the convection electric field are quite strong in situations of low disturbance level. The quiet time convection electric field strength at 2100 MLT in the geostationary orbit obtained from this analysis varies in the range 0.15 to 0.3 keV/Re. Six hours earlier or later in the satellite orbit the convection field is four times stronger. Also when the convection field varies, information about its magnitude can be obtained from the keV electron measurements. Author (ESA)

N82-10637 Texas Univ. at Dallas.
ELECTROMAGNETIC SOUNDINGS IN CALIFORNIA, NEW MEXICO AND WISCONSIN Ph.D. Thesis
Victor Julio Lopez Correa 1981 228 p
Avail: Univ. Microfilms Order No. 8118230

Frequency dependent transfer functions and inductive responses derived from the recorded geomagnetic fluctuations in California and New Mexico permitted the location of lateral inhomogeneties in the electrical conductivity distribution of the crust and upper mantle that help to understand the thermo-tectonic setting in these regions. The lateral inhomogeneties are interpreted as near surface and deep seated highly two dimensional (greater than 60 percent) conductive zones that strike normal to the directions of the inductive response vectors. Dissert. Abstr.

N82-10638 Texas Univ. at Dallas.
SEISMIC VELOCITY MODELING FROM AN ENSEMBLE OF EARTHQUAKES Ph.D. Thesis
Hong-Bing Liaw 1981 155 p
Avail: Univ. Microfilms Order No. 8118229

An algorithm for solving non linear inverse problems is developed. As test of this algorithm is made for simultaneous determination of hypocentral and velocity parameters using hypothetical P wave travel-time data. The algorithm is applied to travel-time data from earthquakes observed in northern Costa Rica. The derived velocity model and relocated earthquakes are tested against other known geophysical data in this region. Some tectonic implications discussed on the basis of focal mechanisms, the relocated earthquakes, and the seismic velocity distribution. Dissert. Abstr.

N82-10639 California Inst. of Tech., Pasadena.
SEISMIC SOURCE PROCESSES AND TECTONICS: OBSERVATIONS OF FOUR INTRACONTINENTAL EARTHQUAKES Ph.D. Thesis
John Joseph Cipar 1981 156 p
Avail: Univ. Microfilms Order No. 8118974

The source processes of four shallow earthquakes and their relation to regional tectonics are presented. Long-period teleseismic P and S waves from the Haicheng, China earthquake of February 4, 1975 are compared directly to time domain synthetic seismograms to infer source parameters. The P wave focal mechanism indicates that faulting was dominantly left-lateral strike-slip along a northwest striking nodal plane. A detailed examination of seismograms recorded by the 1976 Friuli, Italy earthquake (May 6, 1976, Ms = 6.5) and two major aftershocks (both on September 15, 1976 at 03h 15m, Ms = 6.0 and 09h 21m, Ms = 5.9) is presented. Teleseismic long period body waves and surface waves radiated by the mainshock and 09h 21m aftershock are studied to determine source characteristics. Focal mechanisms along with geological evidence suggest that both events represent underthrusting of the Friuli Plain beneath the Southern Alps. The depths of both earthquakes, estimated by matching synthetic body wave seismograms to observations, are found to lie between 6 and 10 km. Dissert. Abstr.

N82-10640 California Univ., Davis.
CHEMICAL AND MINERALOGICAL COMPOSITION AND

BEHAVIOR OF THE MANCOS SHALE AS A DIFFUSE SOURCE OF SALTS IN THE UPPER COLORADO RIVER BASIN Ph.D. Thesis
Vasilios Petros Evangelou 1981 210 p
Avail: Univ. Microfilms Order No. 8117567

A automated kinetic dissolution method for analysis of calcite and dolomite was developed. Calcite dolomite contribute relatively small but significant quantities of soluble ions to waters permeating Mancos Shale. Following emergence of the Mancos formation and recession of waters of the Cretaceous sea environment, the remaining waters of the sedimentary formation evaporated. As waters evaporated, soluble calcium concentration was maintained at a low level relative to sodium and magnesium through precipitation of calcite and gypsum. Surficially exposed Mancos Shale weathers rapidly to produce a permeable, unconsolidated surface veneer in which the gypsum is more intimately mixed with other components of the shale. Waters draining from the weathered Mancos Shale contain the calcium exchanged sodium and magnesium together with calcium and sulfate from gypsum and with lesser quantities of calcium, magnesium and bicarbonates dissolved from carbonates in the shale. Dissert. Abstr.

N82-10641 Indiana Univ., Indianapolis.
THE MINERALOGY AND PETROLOGY OF THE WILLIMANTIC DOME, EASTERN CONNECTICUT Ph.D. Thesis
James Scott Fout 1981 256 p
Avail: Univ. Microfilms Order No. 8119051

The Willimantic dome is a shallow amplitude gneiss dome. Because it is isolated tectonically from the other antiformal belts and gneiss dome sequences in New England, the Willimantic dome was examined structurally and petrologically to determine its relationship to the other major structures in eastern Connecticut. Field work indicates that the Willimantic dome consists of a core gneiss of oligoclase-quartz-monzonite, designated the Willimantic Gneiss, surrounded by a plagioclase-biotite-hornblende gneiss designated the Plagioclase Gneiss, and the Tatnic Hill Formation, a complicated series of pelitic schists. Compositional layering and intercalated sediments indicate that the Willimantic dome represents a relict stratigraphic pile. Regional deformation occurred along the Willimantic Thrust Fault located at the contact between the Plagioclase Gneiss and the Tatnic Hill Formation.
Dissert. Abstr.

N82-10642 California Univ., Berkeley.
THE COLIMA VOLCANIC COMPLEX, MEXICO. 1: POST-CALDERA ANDESITES FROM VOLCAN C LIMA. 2: LATE-QUATERNARY CINDER CONES Ph.D. Thesis
James Francis Luhr 1980 221 p
Avail: Univ. Microfilms Order No. 8113116

Major and trace element analyses of whole rock samples and all constituent phases for a suite of nine postcaldera hornblende and olivine andesites are presented. Samples from Colima's four major eruptions since 1869, spanning the last two eruptive cycles are included. Colima's postcaldera andesites are poor in K and other incompatible elements characteristic of near trench andesites. From the 1913 ashflow eruption through the fourth cycle andesites, increases occurred in whole rock abundances. The most pronounced Mg rich rims occur in the olivine andesites and reflect preeruptive magma mixing. The post 1961, fourth cycle andesites display features which distinguish them from earlier postcaldera hornblende andesites of similar bulk composition. It is suggested that the fourth cycle andesites were less hydrous prior to eruption. The slight Mg rich pyroxene rims in pre 1961 hornblende andesites record late stage preeruptive increases in magmatic water content. The fourth cycle andesites did not experience a strong, preeruptive influx of water, resulting in lower magmatic water content and normally zoned pyroxenes. Dissert. Abstr.

N82-10643 Massachusetts Univ., Boston.
THE BEDROCK GEOLOGY OF THE COLRAIN QUADRANGLE MASSACHUSETTS-VERMONT 1980 Ph.D. Thesis
Jeffrey William Pferd 1981 367 p
Avail: Univ. Microfilms Order No. 8118035

The Colrain quadrangle of west-central Massachusetts lies within the Connecticut Valley-Gaspe Synclinorium and contains a Vermont-type structural dome. The quadrangle is underlain by Paleozoic metamorphic and intrusive rocks that are unconformably overlain in a small area on the southeast by Triassic continental sedimentary rocks. The Paleozoic rocks are of the Vermont sequence and consist from oldest to youngest of Goshen Formation (Northfield in Vermont), Waits River Formation, Standing Pond Volcanics and Gile Mountain Formation. The Goshen formation consists of graphitic, quartz-mica schist, quartz granulites and rare, but laterally extensive, calcareous granulities. Two members are recognized and are believed to be facies equivalents of one another. The Waits River Formation is comprised of two subdivisions; the lower Thin-bedded Carbonate Member and the upper Thick-bedded Carbonate Member. Both consist of rusty-weathering mica schists and punky brown-weathering calcareous granulites. Dissert. Abstr.

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N82-10644 West Virginia Univ., Morgantown.
RAINFALL CATCH ERRORS ASSOCIATED WITH CIRCUMAMBIENT OBSTRUCTIONS Ph.D. Thesis
Edward William Repa 1981 182 p
Avail: Univ. Microfilms Order No. 8118414

The effects of circumambient obstructions of rainfall catch were determined. Procedures included: (1) construction of tractable obstruction models for field testing that conform to boundary conditions inherent in natural sites; (2) observe rainfall catch, wind speed, and rainfall intensity for individual rain storms under a variety of air mass conditions; (3) develop a deterministic model based on physical theory to predict the effects of circumambient obstructions on rainfall catch; and (4) compare actual rainfall catch to the theoretical catch. Results showed that gage catch was a function of screening angle, where the average maximum catch occurred at an angle of 26.57 deg. Rainfall catch decreased sharply as screening angles increased from 26.57 deg and decreased slightly as screening angle decreased. Increased wind speeds, and decreased rainfall intensities, resulted in larger rainfall catch deficits especially for larger screening angles. Theoretical catch was found to accurately predict actual catch except for very high intensities.
Dissert. Abstr.

N82-10645 Colorado State Univ., Fort Collins.
TROPICAL CYCLONE STRUCTURE AND INTENSITY CHANGE Ph.D. Thesis
Edwin Nunez 1981 298 p
Avail: Univ. Microfilms Order No. 8119720

Utilizing the compositing approach, fourteen years (1961-1974) of northwest Atlantic rawinsonde soundings are analyzed to obtain the basic thermodynamic and wind fields of the hurricane. A comparison is undertaken of the basic structure of the composited west Atlantic hurricane and the west Pacific typhoon. Similarities and difference are discussed. In order to investigate differences which lead to tropical cyclone genesis and intensification, eighteen Atlantic and Pacific data sets were composited and divided into two groups: deepening, and filling/steady systems. Deepening systems are found to have supergradient winds in the lower troposphere and less subgradient winds in the upper levels than filling/steady disturbances. The thermal wind equation indicates that an imbalance exists such that deepening systems have larger vertical tangential wind shear (WS) than baroclinicity. The opposite is true of filling systems.
Dissert. Abstr.

N82-10646 Colorado State Univ., Fort Collins.
CLOUD TRACKING FROM SATELLITE PICTURES Ph.D. Thesis
Uwe Ludwig Haass 1981 128 p
Avail: Univ. Microfilms Order No. 8119704

Several methods of motion analysis are introduced based on different signal characterizations and various degrees of image abstraction. Using the discrete luminance information (half-tone picture), the maximum of the inner product surface of two consecutive images serves as a lateral displacement estimator.

The maximum peak detectability can be improved by prefiltering with a non-causal planar least-squares inverse filter. Although this filter is derived from theoretical considerations, the resulting high-pass frequency characteristic commends its use for another reason: since most of the cloud information, such as edges and texture, is embedded in the high-frequency parts of the image, the subsequent inner product operation takes only the homogeneous displacement of these features into account. For clouds that have undergone severe shape changes, a gradual shift to less restrictive frequency characteristics is suggested.
Dissert. Abstr.

N82-10647 Colorado State Univ., Fort Collins.
THE STRUCTURE AND LIFE-CYCLE OF MIDLATITUDE MESOSCALE CONVECTIVE COMPLEXES Ph.D. Thesis
Robert Alan Maddox 1981 331 p
Avail: Univ. Microfilms Order No. 8119716

Enhanced infrared satellite imagery was used to document the existence and frequent occurrence, over middle latitudes of the United States, of large, convectively driven weather systems. These systems, named Mesoscale Convective Complexes (MCCs), frequently produce a variety of severe convective weather phenomena (such as tornadoes, hailstorms and flash floods) that significantly impact human activities. A preliminary climatology of MCCs, based on satellite data from two warm seasons, indicates tha these systems frequently affect United States agricultural regions and it is hypothesized that MCCs produce a highly significant portion of the growing season precipitation over these areas.
Dissert. Abstr.

N82-10648 Colorado State Univ., Fort Collins.
A CLIMATE INDEX DERIVED FROM SATELLITE MEASURED SPECTRAL INFRARED RADIATION Ph.D. Thesis
Michael David Abel 1981 157 p
Avail: Univ. Microfilms Order No. 8119684

It is assumed that clouds and climate are closely related and a change in one will result in a change in the other. Because the index developed is a function of the cloud, temperature, and moisture distributions, it may be used as a climate index. The advantage is that the index is more accurately retrieved from satellite data than cloudiness per se. The VIRES index (vertical infrared radiative emitting structure), is based upon the shape and relative magnitude of the broadband weighting function of the infrared radiative transfer equation. The broadband weighting curves were retrieved from simulated satellite infrared sounder data (spectral radiances). The retrieval procedure is described and error sensitivities of this method were investigated. Index measuring options and possible applications of the VIRES index are proposed.
Dissert. Abstr.

N82-10649 Colorado State Univ., Fort Collins.
WAVE-MEAN FLOW INTERACTIONS AND SOLAR-WEATHER EFFECTS Ph.D. Thesis
Alison Frances Colvill Bridger 1981 149 p
Avail: Univ. Microfilms Order No. 8119693

A time-dependent, hemispheric, primitive-equation numerical model is constructed to test Hines' hypothesis that solar variations induce changes in the distributions of basic state variables at high levels in the atmosphere, and thus induce changes in planetary-scale wave structure at lower atmospheric levels. The induced changes of the basic state zonal wind field are of primary concern. Sensitivity studies reveal that planetary-scale wave structure is sensitive to the assumed initial basic state zonal wind distribution. The stratospheric sudden warming, which is driven by the interaction of such a large-scale wave with the zonally averaged flow, is therefore also sensitive to the initial basic state fields. The distributions of the latitudinal gradient of basic state potential vorticity, and the fields of wave energy flux at selected times, prove to be useful tools in diagnosing the atmosphere's response to forcing by a wave. Lower atmospheric wave structure is found to be insensitive to solar-induced changes in the upper atmosphere. Such changes as do occur are limited to within about 30 kilometers below the level of maximum heating, and are also quite short-lived.
Dissert. Abstr.

N82-10650*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
VECTOR WIND PROFILE GUST MODEL
S. I. Adelfang (Computer Sciences Corp., Huntsville, Ala.) and O. E. Smith Aug. 1981 38 p refs
(NASA-TM-82441) Avail: NTIS HC A03/MF A01 CSCL 04B

The development of a vector wind gust model that is suitable for orbital flight test operations and trade studies was studied. Verification of the hypothesis that gust component variables are gamma distributed, gust modulus is approximately Weibull distributed, and zonal and meridional gust components are bivariate gamma distributed is emphasized. A method of testing for bivariate gamma distributed variables, and two distributions for gust modulus are described. The results of extensive hypothesis testing of one of the distributions are presented, and the validity of the gamma distribution for representation of gust component variables is established.
E.A.K.

N82-10651*# Kentucky Univ., Lexington. Dept. of Chemical Engineering.
AN ALGORITHM TO GENERATE INPUT DATA FROM METEOROLOGICAL AND SPACE SHUTTLE OBSERVATIONS TO VALIDATE A CH4-CO MODEL Final Report, 1 Feb. 1978 - 31 Oct. 1980
Leonard K. Peters and John Yamanis 15 Oct. 1981 109 p refs
(Grant NsG-1501)
(NASA-CR-164899) Avail: NTIS HC A06/MF A01 CSCL 04B

Objective procedures to analyze data from meteorological and space shuttle observations to validate a three dimensional model were investigated. The transport and chemistry of carbon monoxide and methane in the troposphere were studied. Four aspects were examined: (1) detailed evaluation of the variational calculus procedure, with the equation of continuity as a strong constraint, for adjustment of global tropospheric wind fields; (2) reduction of the National Meteorological Center (NMC) data tapes for data input to the OSTA-1/MAPS Experiment; (3) interpolation of the NMC Data for input to the CH4-CO model; and (4) temporal and spatial interpolation procedures of the CO measurements from the OSTA-1/MAPS Experiment to generate usable contours of the data.
B.W.

N82-10652*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
EQUATORIAL SUPERROTATION IN A THERMALLY DRIVEN ZONALLY SYMMETRIC CIRCULATION
H. G. Mayr and I. Harris Sep. 1981 61 p refs Presented at AGU Meeting, 1981 and IAGA Sci. Assembly, Edinburg, 1981 Submitted for publication
(NASA-TM-83832) Avail: NTIS HC A04/MF A01 CSCL 04B

Near the equator where the Coriolis force vanishes, the momentum balance for the axially symmetric circulation is established between horizontal and vertical diffusion, which, a priori, does not impose constraints on the direction or magnitude of the zonal winds. Solar radiation absorbed at low latitudes is a major force in driving large scale motions with air rising near the equator and falling at higher latitudes. In the upper leg of the meridional cell, angular momentum is redistributed so that the atmosphere tends to subrotate (or corotate) at low latitudes and superrotate at high latitudes. In the lower leg, however, the process is reversed and produces a tendency for the equatorial region to superrotate. The outcome depends on the energy budget which is closely coupled to the momentum budget through the thermal wind equation; a pressure (temperature) maximum is required to sustain equatorial superrotation. Such a condition arises in regions which are convectively unstable and the temperature lapse rate is superadiabatic. It should arise in the tropospheres of Jupiter and Saturn; planetary energy from the interior is carried to higher altitudes where radiation to space becomes important. Upward equatorial motions in the direct and indirect circulations (Ferrel-Thomson type) imposed by insolation can then trap dynamic energy for equatorial heating which can sustain the superrotation of the equatorial region.
Author

N82-10653# University of Central Florida, Orlando. Dept. of Mathematics and Statistics.
SOME MODELS FOR VISIBILITY FOR GERMAN STATIONS Scientific Report, 1 Sep. 1979 - 14 Apr. 1981

Paul N. Somerville Hanscom AFB, Mass. AFGL 15 Apr. 1981 40 p refs
(Contract F19628-80-C-0004; AF Proj. 6670)
(AD-A104167; AFGL-TR-81-0144; SR-4) Avail: NTIS HC A03/MF A01 CSCL 04/2

A goal of the Air Weather Service is to be able to expeditiously give the probability that a weather element will have a value above a specified threshold for any location and any time. In previous reports, the present investigators have shown how probability models can be constructed for such weather elements as visibility, ceiling, sky cover, precipitation and windspeed for stations where records exist, so that the required probabilities can be easily calculated. More recently studies have been made to develop models for visibility where data does not exist. The pilot study was made using data from Germany. Models for visibility were developed for thirty German stations for different months and times of day using the Weibull distribution. Regression runs were made to obtain expressions for parameter estimates as functions of variables such as elevation, relative elevation, proximity to water, direction of terrain at the station, etc. These expressions are then usable to obtain Weibull model parameter estimates for arbitrary locations. The present report gives the Weibull parameter estimates for the thirty German stations for each month of the year and eight times of day. Measures of model accuracies for the different stations are also given. The data used to develop the models was extracted from the 'Revised Uniform Summary of Weather Observations' (RUSSWO's) prepared by the Data Processing Division of the Air Weather Service. Author (GRA)

N82-10654# Maryland Univ., College Park. Dept. of Meteorology.
CLIMATOLOGICAL RELATIONSHIPS BETWEEN MONTHLY MEAN SURFACE TEMPERATURE AND MID-TROPOSPHERIC HEIGHTS Progress Report, 1 Nov. 1980 - 30 Jun. 1981
William H. Klein 1981 36 p refs
(Contract DE-AS05-81EV-10539)
(DE81-029841; DOE/EV-10539/T1) Avail: NTIS HC A03/MF A01

The screening process to improve the accuracy of monthly mean temperature forecasts in the contiguous United States is reported. Rederation of the statistical equations now used to specify mean temperature anomalies from mean height anomalies are examined. It is decided to compute all future correlation fields from anomalies, rather than absolute values of temperature and height. DOE

N82-10655# Pacific Northwest Lab., Richland, Wash. Atmospheric Sciences Dept.
ANALYSIS OF DATA FROM THE US DEPARTMENT OF ENERGY'S METEOROLOGICAL VALIDATION PROGRAM
William F. Sandusky and John W. Buck Jun. 1981 19 p refs Presented at the Pacific Div., Am. Assoc. for the Advan. of Sci. Ann. Meeting, Richland, Wash., 15-18 Jun. 1981
(Contract DE-AC06-76RL-01830)
(DE81-030100; PNL-SA-9411; CONF-8106152-1) Avail: NTIS HC A02/MF A01

The history of the meteorological validation program (MVP) and its unique features of the summarized data for candidate sites are described. Available wind power for each site and the projected power for a MOD-2 turbine at each site is provided. Wind power data are compared to data from the resource assessment program to locate areas of high wind energy potential in the contiguous United States, Alaska and Puerto Rico. The effect of data recording techniques and averaging period of the data on Weibull distribution parameters are included. DOE

N82-10656# Technical Research Centre of Finland, Espoo. Lab. of Structural Engineering.
GENERAL CONDITIONS IN ARCTIC AREAS [ARKTISTEN ALUEITTEN YLEISET OLOSUH TEET]
Juhani Karri May 1981 63 p refs In FINNISH; ENGLISH summary
(VTT-12; ISBN-951-38-1189-1; ISSN-0357-7031) Avail: NTIS HC A04/MF A01

General climatological conditions in arctic areas are described. Average and minimum values of temperatures are presented. From other climatological factors, precipitation, snow conditions, visibility, cloudiness and wind conditions are dealt with. The extent of permafrost and its influence on construction are briefly described. The seismically active areas are presented. The extent of sea ice and its forms of appearance are clarified in the arctic areas generally, and more precisely in the Eurasian arctic seas. Author (ESA)

N82-10657# European Space Agency, Paris (France).
RADIATION BUDGET OF THE TROPICAL ATMOSPHERE: RESULTS FROM MEASUREMENTS OF THE HEMISPHERICAL RADIANT FLUX DENSITIES IN THE VISIBLE SPECTRAL RANGE DURING THE '1969 ATLANTIC EXPEDITION'
Heinz Queck Mar. 1981 92 p refs Transl. into ENGLISH of "Ergebnisse zum Strahlungsumsatz in der tropischen Atmosphaere aus Messungen der hemisphaerischen Strahlungsflussdichten in sichtbaren Spektralbereich waehrend der Atlantischen Expedition 1969" Rept. DFVLR-EB-79-36 DFVLR, Oberpfaffenhofen, West Germany, 1979 93 p Original report in GERMAN previously announced as N81-10623
(ESA-TT-658; DFVLR-FB-79-36) Avail: NTIS HC A04/MF A01; DFVLR, Cologne DM 16.20

Some 67 radio probes measuring the radiant flux densities from the upper and lower hemispheres in the visible spectral range were launched from aboard the German research vessels Meteor, Planet and the American research vessel Discoverer. The receivers of the probes had their optical centers at 550 and 684 nm. The radiant flux densities from both hemispheres are given as a function of height with the frequency distributions. The components of the radiation budget, spectral absorbed, reflected and transmitted portions, are given. The resulting spectral heating rates are presented. Author (ESA)

N82-10658# Illinois State Water Survey, Urbana.
ILLINOIS THIRD CONSECUTIVE SEVERE WINTER: FOR 1978-1979
Stanley A. Changnon, David Changnon, and Phyllis Stone 1980 42 p refs Sponsored by State of Illinois
(PB81-218240; ISWS/RI-94/80) Avail: NTIS HC A03/MF A01 CSCL 04B

Seventeen major winter storms, the state's record coldest January-February, and record snow depths gave the winter of 1978-1979 a rank as the second worst statewide for Illinois, exceeded only by the prior winter of 1977-1978. In the northern fourth of Illinois, the 1978-1979 winter was the worst on record. Average snowfall for the state was 42.8 inches, or 23.3 inches above normal. The 1978-1979 winter had a myriad of socioeconomic impacts, the most serious ones in the Chicago metropolitan area. Ten deaths and at least 60 serious injuries were attributed to the storms. GRA

N82-10659# National Severe Storms Lab., Norman, Okla.
SUMMARY OF AEC-ERDA-NRC SUPPORTED RESEARCH AT NSSL 1973-1979
J. T. Lee, ed., Dusan S. Zrnic, Robert P. Davies-Jones, and Joseph H. Golden Mar. 1981 110 p refs Sponsored by the National Oceanic and Atmospheric Administration
(PB81-220162; NOAA-TM-ERL-NSSL-90; NOAA-81043004) Avail: NTIS HC A06/MF A01 CSCL 04B

In 1973, the mutual interest in tornado wind and pressure structure witnessed the formation of a cooperative research program between the National Oceanic and Atmospheric Administration's (NOAA) National Severe Storms Laboratory at Norman, Oklahoma and the Atomic Energy Commission (AEC) with its successor organization the Energy Research and Development Administration (ERDA) and the Nuclear Regulatory Commission (NRC). An overview of the research and results generated through the coordinated effort is presented. This research proceeded along several lines - direct observations such as radar and photographic, indirect observations such as damage inferred wind flows, and modeling. GRA

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N82-10660 Texas Univ. at Arlington.
A GLOBAL ATLAS OF GEOS-3 SIGNIFICANT WAVEHEIGHT

AND COMPARISON OF THE DATA WITH NATIONAL BUOY DATA Ph.D. Thesis
James Douglas McMillan 1981 147 p
Avail: Univ. Microfilms Order No. 8119337

The GEOS-3 significant waveheight estimation algorithm is derived by analyzing the return waveform characteristics of the altimeter. It is shown that the difference between the waveform expected from a flat surface and the actual waveform observed returning from a nonflat sea surface can be analyzed to determine the magnitude of the significant waveheight. This technique employs a curve fitting procedure utilizing least squares estimation. The rationale for a smoothing technique is presented and the convergence characteristics of the smoothed estimate are discussed. Then, a statistically representative sampling of GEOS-3 data is selected for comparison with buoy measurements and the accuracy of the GEOS-3 significant waveheight estimates is deduced, through statistical analysis, to be 50 cm. The GEOS-3 significant waveheight estimates gathered during the entire mission of the spacecraft are assembled in the form of a global atlas of contour maps. Both high and low sea state contour maps are presented, and the data are displayed both by seasons and for the entire duration of the GEOS-3 mission. The contour maps are then compared with contour maps compiled by the U.S. Navy and significant differences are found. Dissert. Abstr.

N82-10661*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
CHESAPEAKE BAY PLUME STUDY: SUPERFLUX 1980
Janet W. Campbell, ed. and James P. Thomas, ed. (National Marine Fisheries Service, Highland, N.J.) Oct. 1981 504 p refs Symp. held at Williamburg, Va., 21-23 Jan. 1981; sponsored in part by National Marine Fisheries Service, NOAA, and Dept. of Commerce
(NASA-CP-2188; L-14680; NOAA/NEMP-111-81-ABCDFG-0042) Avail: NTIS HC A22/MF A01 CSCL 08C

The results of the Chesapeake Bay plume study are reported. The role of remote sensing in monitoring and assessing the effects of pollution of marine resources is delineated. For individual titles, see N82-10662 through N82-10695.

N82-10662*# Virginia Inst. of Marine Science, Gloucester Point.
A BENCHMARK-MULTI-DISCIPLINARY STUDY OF THE INTERACTION BETWEEN THE CHESAPEAKE BAY AND ADJACENT WATERS OF THE VIRGINIAN SEA
William J. Hargis, Jr. *In* NASA. Langley Research Center Chesapeake Bay Plume Study Oct. 1981 p 1-4 refs (For primary document see N82-10661 01-48)
Avail: NTIS HC A22/MF A01 CSCL 08C

The social and economic importance of estuaries are discussed. Major focus is on the Chesapeake Bay and its interaction with the adjacent waters of the Virginia Sea. Associated multiple use development and management problems as well as their internal physical, geological, chemical, and biological complexities are described. R.C.T.

N82-10663*# National Marine Fisheries Service, Highlands, N.J. Div. of Environmental Assessment.
A MARINE ENVIRONMENTAL MONITORING AND ASSESSMENT PROGRAM
John B. Pearce *In* NASA. Langley Research Center Cheasapeake Bay Plume Study Oct. 1981 p 15-28 refs (For primary document see N82-10661 01-48)
Avail: NTIS HC A22/MF A01 CSCL 08C

The need for the use of modern, extremely sensitive techniques to aid in rapidly and synoptically assessing the relative health and production of coastal waters and estuaries is reported. Major emphasis is placed on establishing a solid foundation for the use of remote sensing in basic oceanographic studies and the management of human wastes. R.C.T.

N82-10664*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SUPERFLUX I, II, AND III EXPERIMENT DESIGN: REMOTE SENSING ASPECTS
Janet W. Campbell, Wayne E. Esaias, and Warren D. Hypes *In its* Chesapeake Bay Plume Study Oct. 1981 p 29-42 refs (For primary document see N82-10661 01-48)
Avail: NTIS HC A22/MF A01 CSCL 08C

The Chesapeake Bay plume study called Superflux is described. The study was initiated to incorporate the disciplines of both resources management and remote sensing in accomplishing the following objectives: (1) process oriented research to understand the impact of estuarine outflows on continental shelf ecosystems; (2) monitoring and assessment to delineate the role of remote sensing in future monitoring and assessment programs; and (3) remote sensing research: to advance the state of the art in remote sensing systems as applied to sensing of the marine environment, thereby hastening the day when remote sensing can be used operationally for monitoring and assessment and for process oriented research. R.C.T.

N82-10665*# National Marine Fisheries Service, Highlands, N.J. Northeast Fisheries Center.
SUPERFLUX I, II, AND III EXPERIMENT DESIGNS: WATER SAMPLING AND ANALYSES
James P. Thomas *In* NASA. Langley Research Center Chesapeake Bay Plume Study Oct. 1981 p 43-60 (For primary document see N82-10661 01-48)
Avail: NTIS HC A22/MF A01 CSCL 08C

Both airborne remote sensors and seagoing research vessels were used to study the effects of man's continual use of the Chesapeake Bay offshore environments. The major focus of the study was to: (1) advance the development and transfer of improved remote sensing systems and techniques for monitoring environmental quality and effects on living marine resources; (2) increase understanding of the influence of estuarine outwellings (plumes) on contiguous shelf ecosystems; and (3) provide a synoptic, integrated and timely data base for application to problems of marine resources and environmental quality. R.C.T.

N82-10666*# Johns Hopkins Univ., Baltimore, Md.
CIRCULATION IN THE CHESAPEAKE BAY ENTRANCE REGION: ESTUARY-SHELF INTERACTION
W. C. Boicourt *In* NASA. Langley Research Center Chesapeake Bay Plume Study Oct. 1981 p 61-78 refs (For primary document see N82-10661 01-48)
Avail: NTIS HC A22/MF A01 CSCL 08C

Current meters and temperature-salinity recorders confirm the assumption that the upper layers of the continental shelf waters off Chesapeake Bay can be banded in summer, such that the coastal boundary layer (consisting of the Bay outflow) and the outer shelf flow southward while the inner shelf flows to the north, driven by the prevailing southerly winds. These measurements show that the estuary itself may also be banded in its lower reaches such that the inflow is confined primarily to the deep channel, while the upper layer outflow is split into two flow maxima on either side of this channel. R.C.T.

N82-10667*# College of William and Mary, Gloucester Point, Va. Remote Sensing Center.
CHESAPEAKE BAY PLUME DYNAMICS FROM LANDSAT
John C. Munday, Jr. and Michael S. Fedosh *In* NASA. Langley Research Center Chesapeake Bay Plume Study Oct. 1981 p 79-92 refs (For primary document see N82-10661 01-48)
(Grant NA80FA-C-00051)
Avail: NTIS HC A22/MF A01 CSCL 08C

LANDSAT images with enhancement and density slicing show that the Chesapeake Bay plume usually frequents the Virginia coast south of the Bay mouth. Southwestern (compared to northern) winds spread the plume easterly over a large area. Ebb tide images (compared to flood tide images) show a more dispersed plume. Flooding waters produce high turbidity levels over the shallow northern portion of the Bay mouth. R.C.T.

N82-10668*# Research Triangle Inst., Research Triangle Park, N. C.
MONITORING THE CHESAPEAKE BAY USING SATELLITE DATA FOR SUPERFLUX III
Fred M. Vukovich and Bobby W. Crissman *In* NASA. Langley Research Center Chesapeake Bay Plume Study Oct. 1981 p 93-110 (For primary document see N82-10661 01-48)
(Grant NA81FA-C-00002)
Avail: NTIS HC A22/MF A01 CSCL 08C

The TIROS-N and NOAA-6, and GOES visible infrared satellite data were used to identify and locate surface oceanographic thermal fronts for the purpose of issuing daily and premission advisory briefings in support of the Superflux 3 in situ and remote sensing experiment in the Chesapeake Bay region. Satellite data were collected for the period 1 - 22 October 1980. A summary of that data is presented. R.C.T.

N82-10669*# Virginia Inst. of Marine Science, Gloucester Point.
TEMPORAL AND SPATIAL VARIATIONS OF THE CHESAPEAKE BAY PLUME
Evon P. Ruzecki *In* NASA. Langley Research Center Chesapeake Bay Plume Study Oct. 1981 p 111-130 refs (For primary document see N82-10661 01-48)
(Grants NA80FE-A0015; NA31FA-C-0005)
Avail: NTIS HC A22/MF A01 CSCL 08C

Historical records and data obtained during the Superflux experiments are used to describe the temporal and spatial variations of the effluent waters of Chesapeake Bay. The alongshore extent of the plume resulting from variations of freshwater discharge into the Bay and the effects of wind are illustrated. Variations of the cross sectional configuration of the plume over portions of a tidal cycle and results of a rapid underway water sampling system are discussed. R.C.T.

N82-10670*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
REMOTE SENSING OF THE CHESAPEAKE BAY PLUME SALINITY VIA MICROWAVE RADIOMETRY
Bruche M. Kendall *In its* Chesapeake Bay Plume Study Oct. 1981 p 131-140 refs (For primary document see N82-10661 01-48)
Avail: NTIS HC A22/MF A01 CSCL 08C

The NASA-Langley-developed L-Band microwave radiometer was used to remotely measure sea surface salinity during the Chesapeake Bay plume studies. Obtained measurements of microwave brightness temperatures of the sea surface were combined with measurements of sea surface temperature obtained with an infrared radiometer and inverted to produce corresponding values of sea surface salinity. Results from the plume measurements, which indicate the southward extent of the plume along the Virginia-North Carolina coast, are presented and discussed. Additional measurements obtained for the Delaware Bay Mouth flight, and the James River-Shelf flight, are also discussed. R.C.T.

N82-10671*# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
MAPPING WATERMASS BOUNDARIES USING FLUOROSENSING LIDAR
Charles C. Sarabun, Jr. *In* NASA. Langley Research Center Chesapeake Bay Plume Study Oct. 1981 p 141-158 refs (For primary document see N82-10661 01-48)
(Contract N00024-81-C-5301)
Avail: NTIS HC A22/MF A01 CSCL 08C

An initial application of multispectral LIDAR data from the NASA airborne oceanographic lidar (AOL) to the mapping of watermass boundaries is presented. The approach uses the multispectral lidar data from the fluorosensing mode in a cluster analysis to define water types. Individual data points are classified as to parent water type(s) and then plotted in plan view to show the watermass boundaries and mixing regions. The methodology was applied to the AOL data from the SUPERFLUX overflights. The results are compared to salinity-mapping radar results from the same region. R.C.T.

N82-10672*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
PRELIMINARY ANALYSIS OF OCEAN COLOR SCANNER DATA FROM SUPERFLUX III
Craig W. Ohlhorst *In its* Chesapeake Bay Plume Study Oct. 1981 p 159-174 (For primary document see N82-10661 01-48)
Avail: NTIS HC A22/MF A01 CSCL 08C

The ocean color scanner collected data Superflux III Experiment Single channel gray scale data products generated 5 minutes after the scanner data were collected showed details of the Chesapeake Plume structure, suggesting that this quick-look capability could have potential use to experimenters in real time. The Chesapeake Bay Plume extended offshore between 5 and 7 nautical miles on two occasions. The scanner data also show many other water features within the lower bay itself. R.C.T.

N82-10673*# Old Dominion Univ., Norfolk, Va.
LAGRANGIAN CIRCULATION STUDY NEAR CAPE HENRY, VIRGINIA
Ronald E. Johnson *In* NASA. Langley Research Center Chesapeake Bay Plume Study Oct. 1981 p 175-198 (For primary document see N82-10661 01-48)
Avail: NTIS HC A22/MF A01 CSCL 08C

A study of the circulation near Cape Henry, Virginia, was made using surface and seabed drifters and radar tracked surface buoys coupled to subsurface drag plates. Drifter releases were conducted on a line normal to the beach just south of Cape Henry. Surface drifter recoveries were few; wind effects were strongly noted. Seabed drifter recoveries all exhibited onshore motion into Chesapeake Bay. Strong winds also affected seabed recoveries, tending to move them farther before recovery. Buoy trajectories in the vicinity of Cape Henry appeared to be of an irrotational nature, showing a clockwise rotary tide motion. Nearest the cape, the buoy motion elongated to almost parallel depth contours around the cape. Buoy motion under the action of strong winds showed that currents to at least the depth of the drag plates substantially are altered from those of low wind conditions near the Bay mouth. Only partial evidence could be found to support the presence of a clockwise nontidal eddy at Virginia Beach, south of Cape Henry. R.C.T.

N82-10674*# Old Dominion Univ., Norfolk, Va.
SUSPENDED PARTICULATE MATTER IN THE CHESAPEAKE BAY ENTRANCE AND ADJACENT SHELF WATERS
Kathryn J. Gingerich and George F. Oertel *In* NASA. Langley Research Center Chesapeake Bay Plume Study Oct. 1981 p 199-222 ref (For primary document see N82-10661 01-48)
Avail: NTIS HC A22/MF A01 CSCL 08C

Approximately 400 samples were collected from the mouth of the Chesapeake Bay for various analyses, including 138 for suspended solids. Characteristics of suspended solids that were analyzed included: total suspended matter; total suspended inorganics, total suspended organics; percent organics; particle size distribution; and presence or absence of 11 of the most prominent particle types. R.C.T.

N82-10675*# Old Dominion Univ., Norfolk, Va.
PARTICLE SIZE DISTRIBUTION OF SUSPENDED SOLIDS IN THE CHESAPEAKE BAY ENTRANCE AND ADJACENT SHELF WATERS
Mark R. Byrnes and George F. Oertel *In* NASA. Langley Research Center Chesapeake Bay Plume Study Oct. 1981 p 223-236 refs (For primary document see N82-10661 01-48)
Avail: NTIS HC A22/MF A01 CSCL 08C

Characteristics of suspended solids, including total suspended matter, total suspended inorganics, total suspended organics, particle size distribution, and the presence of the ten most prominent particle types were determined. Four research vessels simultaneously collected samples along four transects. Samples were collected within a 2-hour period that coincided with the maximum ebb penetration of Chesapeake Bay outwelling. The distribution of primary and secondary particle size modes indicate the presence of a surface or near-surface plume, possibly associated with three sources: (1) runoff, (2) resuspension of material within the Bay, and/or (3) resuspension of material in the area of shoals at the Bay mouth. Additional supportive evidence for this conclusion is illustrated with ocean color scanner data. M.G.

N82-10676*# Old Dominion Univ., Norfolk, Va.
CONCENTRATION OF HYDROCARBONS ASSOCIATED WITH PARTICLES IN THE SHELF WATERS ADJACENT TO THE ENTRANCE OF CHESAPEAKE BAY
Terry L. Wade and George F. Oertel *In* NASA. Langley Research Center Chesapeake Bay Plume Study Oct. 1981 p 237-242 refs (For primary document see N82-10661 01-48)
Avail: NTIS HC A22/MF A01 CSCL 08C

Particulate hydrocarbon concentrations were measured in 94 water samples. The concentrations ranged from below the

detection limit (> 0.7 micro-G/L) to 32 micro-g/l. The mean for all samples was 5.6 micro-g/l. Particulate hydrocarbon concentrations are higher in the Bay mouth and lower in the shelf waters adjacent to the entrance of Chesapeake Bay. No coherent particulate hydrocarbon distribution is seen with depth in the water column. The Bay is postulated as one of the possible chronic sources of particulate hydrocarbons for the adjacent shelf waters. M.G.

N82-10677*# Old Dominion Univ., Norfolk, Va.
COPROSTANOL AS A POTENTIAL TRACER OF PARTICULATE SEWAGE EFFLUENT TO SHELF WATERS ADJACENT TO THE CHESAPEAKE BAY
Robert C. Brown and Terry L. Wade *In* NASA. Langley Research Center Chesapeake Bay Plume Study Oct. 1981 p 243-250 refs (For primary document see N82-10661 01-48)
Avail: NTIS HC A22/MF A01 CSCL 08C

Samples were collected in the Chesapeake Bay entrance and contiguous shelf waters and were subsequently analyzed for particulate coprostanol and cholesterol concentrations. Surface coprostanol concentrations were fairly uniform, with a slight increase with depth. This increase with depth may be due to sewage-associated particulates settling as they leave the Bay, or the resuspension of contaminated sediment. Preliminary findings indicate sewage-associated materials are being transported from the Chesapeake Bay to shelf waters, where they may have a detrimental affect on living marine resources. Author

N82-10678*# Old Dominion Univ., Norfolk, Va.
CHARACTERISTICS OF TOTAL SUSPENDED MATTER AND ASSOCIATED HYDROCARBON CONCENTRATION ADJACENT TO THE CHESAPEAKE BAY ENTRANCE
George F. Oertel and Terry L. Wade *In* NASA. Langley Research Center Chesapeake Bay Plume Study Oct. 1981 p 251-260 refs (For primary document see N82-10661 01-48)
Avail: NTIS HC A22/MF A01 CSCL 08C

Methodologies used to determine concentrations of hydrocarbons and associated suspended particulates at stations in and adjacent to the entrance to the Chesapeake Bay are described and the results are presented. Passive and active remote sensing data were acquired in conjunction with sea truth data collection. M.G.

N82-10679*# Old Dominion Univ., Norfolk, Va. Dept. of Oceanography.
NUTRIENTS IN WATERS ON THE INNER SHELF BETWEEN CAPE CHARLES AND CAPE HATTERAS
George T. F. Wong and James F. Todd *In* NASA. Langley Research Center Chesapeake Bay Plume Study Oct. 1981 p 251-282 refs (For primary document see N82-10661 01-48)
Avail: NTIS HC A22/MF A01 CSCL 08C

The distribution of nutrients in the shelf waters of the southern tip of the Middle Atlantic Bight was investigated. It is concluded that the outflow of freshwater from the Chesapeake Bay is a potential source of nutrients to the adjacent shelf waters. However, a quantitative estimation of its importance cannot yet be made because (1) there are other sources of nutrients to the study area and these sources cannot yet be quantified and (2) the concentrations of nutrients in the outflow from Chesapeake Bay exhibit significant short-term and long-term temporal variabilities. M.G.

N82-10680*# Delaware Univ., Newark. College of Marine Studies.
REMOTE SENSING OF OPTICALLY SHALLOW, VERTICALLY INHOMOGENEOUS WATERS: A MATHEMATICAL MODEL
W. D. Philpot and S. G. Ackleson *In* NASA. Langley Research Center Chesapeake Bay Plume Study Oct. 1981 p 283-300 refs (For primary document see N82-10661 01-48)
(Contract NOAA-NA80-AA-D-00106)
Avail: NTIS HC A22/MF A01 CSCL 08C

A multiple-layer radiative transfer model of a vertically inhomogeneous, optically shallow water mass is briefly described. This model is directed toward use in remote sensing properties. Some preliminary results and qualitative predictions are presented. Author

N82-10681*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
REAL-TIME TEST OF MOCS ALGORITHM DURING SUPERFLUX 1980
Gary W. Grew *In its* Chesapeake Bay Plume Study Oct. 1981 p 301-322 refs (For primary document see N82-10661 01-48)
Avail: NTIS HC A22/MF A01 CSCL 08C

A remote sensing experiment was conducted in which success depended upon the real-time use of an algorithm, generated from MOCS (multichannel ocean color sensor) data onboard the NASA P-3 aircraft, to direct the NOAA ship Kelez to oceanic stations where vitally needed sea truth could be collected. Remote data sets collected on two consecutive days of the mission were consistent with the sea truth for low concentrations of chlorophyll a. Two oceanic regions of special interest were located. The algorithm and the collected data are described. M.G.

N82-10682*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ANALYSIS OF TESTBED AIRBORNE MULTISPECTRAL SCANNER DATA FROM SUPERFLUX II
David E. Bowker, Charles A. Hardesty, Daniel J. Jobson, and Gilbert S. Bahn (Kentron International, Inc.) *In its* Chesapeake Bay Plume Study Oct. 1981 p 323-338 (For primary document see N82-10661 01-48)
Avail: NTIS HC A22/MF A01 CSCL 08C

A test bed aircraft multispectral scanner (TBAMS) was flown during the James Shelf, Plume Scan, and Chesapeake Bay missions as part of the Superflux 2 experiment. Excellent correlations were obtained between water sample measurements of chlorophyll and sediment and TBAMS radiance data. The three-band algorithms used were insensitive to aircraft altitude and varying atmospheric conditions. This was particularly fortunate due to the hazy conditions during most of the experiments. A contour map of sediment, and also chlorophyll, was derived for the Chesapeake Bay plume along the southern Virginia-Carolina coastline. A sediment maximum occurs about 5 nautical miles off the Virginia Beach coast with a chlorophyll maximum slightly shoreward of this. During the James Shelf mission, a thermal anomaly (or front) was encountered about 50 miles from the coast. There was a minor variation in chlorophyll and sediment across the boundary. During the Chesapeake Bay mission, the Sun elevation increased from 50 degrees to over 70 degrees, interfering with the generation of data products. M.G.

N82-10683*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
LASER REMOTE SENSING OF MARINE SEDIMENT LOAD AND ALGAL PIGMENTS: LABORATORY EXPERIMENTS
R. J. Exton and W. M. Houghton *In its* Chesapeake Bay Plume Study Oct. 1981 p 339-348 (For primary document see N82-10661 01-48)
Avail: NTIS HC A22/MF A01 CSCL 08C

The fluorescence emission spectra for estuarine water samples excited by an argon laser at 514.5 nm were analyzed. The features of interest were: (1) scattering at the laser wavelength by particulates (Mie); (2) fluorescence from the pigments chlorophyl a and phycoerythrin; (3) Raman scattering by water; and (4) fluorescence by dissolved organic matter. It is shown that these intensities increase with the concentration of the corresponding material and decrease with attenuation. Since the concentration of water is constant the Raman intensity provides a direct measure of attenuation. M.G.

N82-10684*# National Aeronautics and Space Administration. Wallops Flight Center, Wallops Island, Va.
APPLICATION OF THE NASA AIRBORNE OCEANOGRAPHIC LIDAR TO THE MAPPING OF CHLOROPHYLL AND OTHER ORGANIC PIGMENTS
F. E. Hoge and R. N. Swift (EG&G Washington Analytical Services Center, Inc.) *In* NASA. Langley Research Center Chesapeake Bay Plume Study Oct. 1981 p 349-374 refs (For primary document see N82-10661 01-48)
Avail: NTIS HC A22/MF A01 CSCL 08C

Laser fluorosensing techniques used for the airborne measurement of chlorophyll a and other naturally occurring waterborne pigments are reviewed. Previous experiments demonstrating the utility of the airborne oceanographic lidar (AOL) for assessment

of various marine parameters are briefly discussed. The configuration of the AOL during the NOAA/NASA Superflux experiments is described. The participation of the AOL in these experiments is presented and the preliminary results are discussed. The importance of multispectral receiving capability in a laser fluorosensing system for providing reproducible measurements over wide areas having spatial variations in water column transmittance properties is addressed. This capability minimizes the number of truthing points required and is usable even in shallow estuarine areas where resuspension of bottom sediment is common. Finally, problems encountered on the Superflux missions and the resulting limitations on the AOL data sets are addressed and feasible solutions to these problems are provided. M.G.

N82-10685*# National Marine Fisheries Service, Highlands, N.J.

TOTAL PLANKTON RESPIRATION IN THE CHESAPEAKE BAY PLUME

Craig N. Robertson and James P. Thomas *In* NASA. Langley Research Center Chesapeake Bay Plume Study Oct. 1981 p 375-390 refs (For primary document see N82-10661 01-48)
Avail: NTIS HC A22/MF A01 CSCL 08C

Total plankton respiration (TPR) was measured at 17 stations within the Chesapeake Bay plume off the Virginia coast during March, June, and October 1980. Elevated rates of TPR, as well as higher concentrations of chlorophyll a and phaeopigment a, were found to be associated with the Bay plume during each survey. The TPR rates within the Bay plume were close to those found associated with the Hudson River plume for comparable times of the year. The data examined indicate that the Chesapeake Bay plume stimulates biological activity and is a source of organic loading to the contiguous shelf ecosystem. M.G.

N82-10686*# College of William and Mary, Williamsburg, Va. Dept. of Microbiology-Pathology.

BACTERIAL BIOMASS AND HETEROTROPHIC POTENTIAL IN THE WATERS OF THE CHESAPEAKE BAY PLUME AND CONTIGUOUS CONTINENTAL SHELF

Howard I. Kator and Paul L. Zubkoff *In* NASA. Langley Research Center Chesapeake Bay Plume Study Oct. 1981 p 391-404 refs (For primary document see N82-10661 01-48)
(Contract NOAA-NA80-FA-C-00035)
Avail: NTIS HC A22/MF A01 CSCL 08C

Seasonal baseline data on bacterial biomass and heterotrophic uptake in the Chesapeake Bay plume and contiguous Atlantic Ocean shelf waters are discussed. Viable count bacterial numbers in surface water samples collected during June 1980 ranged from a maximum of 190,000 MPN (most probable number)/ml at the Bay mouth to a minimum of 7900 MPN/ml offshore. Similarly, direct count densities ranged from 1,800,000 BU (bacterial units)/ml to 24,000 BU/ml. Heterotrophic potential (V max) was largest at the Bay mouth and lowest offshore. Biomass and V max values usually decreased with depth although subsurface maxima were occasionally observed at inshore stations. Correlation of biomass and heterotrophic potential data with selected hydrographic variables was determind with a nonparametric statistic. Results indicate viable counts are positively and significantly correlated with total chlorophyll, temperature, direct count and V max during June 1980; significant negative correlations are obtained with salinity and depth. Calculations of bacterial standing crop are discussed. M.G.

N82-10687*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

ANALYSIS OF ALOPE DATA FROM SUPERFLUX

Olin Jarrett, Jr., Wayne E. Esaias, Clarence A. Brown, Jr., and E. Brian Pritchard *In its* Chesapeake Bay Plume Study Oct. 1981 p 405-416 refs (For primary document see N82-10661 01-48)
Avail: NTIS HC A22/MF A01

Remote sensing data collected with the airborne lidar oceanographic probing experiment (ALOPE) laser fluorosensor during the Superflux 1 and Superflux 2 experiments were analyzed using two techniques. A qualitative technique which requires no supplementary data provided a near-real-time estimate of relative abundance of the golden-brown and green phytoplankton color groups. Contour plots developed for the later mission are used to demonstrate the utility of this technique. A quantitative technique which requires supplementary data to define the attenuation coefficient provides chlorophyll a concentration by color group. The sum of the golden-brown and green chlorophyll a data yields total chlorophyll a values which may be compared with in situ data. As expected, the golden-brown population was dominant in the Chesapeake Bay and the Bay plume whereas the green population was dominant in shelf waters. M.G.

N82-10688*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

AN ALGORITHM FOR COMPUTING CHLOROPHYLL-A CONCENTRATIONS USING A DUAL-FREQUENCY FLUOROSENSOR

Janet W. Campbell *In its* Chesapeake Bay Plume Study Oct. 1981 p 417-428 (For primary document see N82-10661 01-48)
Avail: NTIS HC A22/MF A01 CSCL 08C

An algorithm to be used on data from a dual-frequency fluorosensor (i.e. one using two wavelengths for excitation of chlorophyll-a fluorescence) to compute total chlorophyll-a concentration and to partition that chlorophyll between two color groups present in a mixed phytoplankton population is described. The algorithm is based on laboratory and field-testing experience gained with the airborne lidar oceanographic probing experiment fluorosensor. M.G.

N82-10689*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

INTERPRETATION OF AN INDEX OF PHYTOPLANKTON POPULATION COMPOSITION CALCULATED FROM REMOTE AIRBORNE FLUORSENSOR (RAF) DATA

Franklin H. Farmer *In its* Chesapeake Bay Plume Study Oct. 1981 p 429-438 refs (For primary document see N82-10661 01-48)
Avail: NTIS HC A22/MF A01 CSCL 08C

The calculation of indices of phytoplankton population composition from chlorophyll a fluorescence at 685 nm excited by narrow band light at 454 and 539 nm is discussed. The ratio of the fluorescence excited by light of these two wavelengths is a function of the distribution of the phytoplankton between two color groups, designated the golden-brown and the green. The golden-brown group consists of those species which have the highly photosynthetically active carotenoid-chlorophyll-a-protein complexes, i.e. members of the classes Bacillariophyceae, diatoms Dinophyceae, dinoflagellates, and some members of the class Prymnesiophyceae. The green color group consists those species of phytoplankton which apparently lack those complexes, i.e. members of the classes Chlorophyceae, Euglenophyceae, Prasinophyceae, Eustigmatophyceae, Xanthophyceae, and a few members of the Prymnesiophyceae. A few species of phytoplankton appear to have intermediate characteristics, and would apparently belong to neither group. Most of these species are members of the class Cryptophyceae. The composition index for this class is examined in detail. M.G.

N82-10690*# Old Dominion Univ., Norfolk, Va. Dept. of Biological Sciences.

PHYTOPLANKTON ASSEMBLAGES WITHIN THE CHESAPEAKE BAY PLUME AND ADJACENT WATERS OF THE CONTINENTAL SHELF

Harold G. Marshall *In* NASA. Langley Research Center Chesapeake Bay Plume Study Oct. 1981 p 439-468 refs (For primary document see N82-10661 01-48)
Avail: NTIS HC A22/MF A01 CSCL 08C

The Chesapeake Bay plume was identified and plotted in relation to the presence and high concentrations of phytoplankton assemblages. Seasonal differences occurred within the plume during the collection period, with Skeletonema costatum and an ultraplankton component the dominant forms. Patchiness was found along the transects, with variations in composition and concentrations common on consecutive day sampling within the plume in its movement along the shelf. The presence of 236 species is noted, with their presence indicated for plume and shelf stations during the March, June, and October 1980 collections. Author

N82-10691*# Old Dominion Univ., Norfolk, Va. Dept. of Biological Sciences.

USE OF ORDINATION AND CLASSIFICATION PROCEDURES TO EVALUATE PHYTOPLANKTON COMMUNITIES DURING SUPERFLUX II

Charles K. Rutledge and Harold G. Marshall *In* NASA. Langley Research Center Chesapeake Bay Plume Study Oct. 1981 p 469-490 refs (For primary document see N82-10661 01-48)
Avail: NTIS HC A22/MF A01 CSCL 08C

Cluster analysis and an ordination procedure were performed on two data matrices to investigate real and environmental spatial relationships. Multiple regression analysis was used to relate the measured environmental variables to the phytoplankton community changes. Qualitative type phytoplankton data proved to be less structured in both of these spaces, relative to the biomass data. The salinity gradients of the northern transects covaried significantly with the phytoplankton association changes. In the southern transects the light variable was most important in explaining the variance in the ordination axes. These data suggest the close relationships between phytoplankton community changes and the physical hydrology of the area. M.G.

N82-10692*# Old Dominion Univ., Norfolk, Va. Dept. of Biological Sciences.

SUPERFLUX CHLOROPHYLL-A ANALYSIS: AN ASSESSMENT OF VARIABILITY IN RESULTS INTRODUCED PRIOR TO FLUOROMETRIC ANALYSIS

S. J. Cibik, Charles K. Rutledge, and C. N. Robertson (National Marine Fisheries Service, Highlands, N.J.) *In* NASA. Langley Research Center Chesapeake Bay Plume Study Oct. 1981 p 491-494 ref (For primary document see N82-10661 01-48)
Avail: NTIS HC A22/MF A01 CSCL 08C

Several experiments were undertaken to identify variability in results that came from procedural differences in the processing of chlorophyll samples prior to fluorometric analysis. T-tests on group means indicated that significant differences (alpha = 0.05) in phaeopigment a concentrations did result in samples not initially screened, but not in the chlorophyll a concentrations. Highly significant differences (alpha = 0.001) in group means were found in samples which were held in acetone after filtering as compared to unfiltered seawater samples held for the same period. No difference in results was found between the 24-hour extraction and samples which were processed immediately. M.G.

N82-10693*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

ASSESSMENT OF SUPERFLUX RELATIVE TO MARINE SCIENCE AND OCEANOGRAPHY

Wayne E. Esaias *In its* Chesapeake Bay Plume Study Oct. 1981 p 495-500 refs (For primary document see N82-10661 01-48)
Avail: NTIS HC A22/MF A01 CSCL 08C

A general assessment of the Superflux project is made in relation to marine science and oceanography. It is commented that the program clearly demonstrated the effectiveness of state-of-the-art technology required to study highly dynamic estuarine plumes, and the necessity of a broadly interdisciplinary, interactive remote sensing and shipboard program required to significantly advance the understanding of transport processes and impacts of estuarine outflows. M.G.

N82-10694*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

ASSESSMENT OF SUPERFLUX RELATIVE TO REMOTE SENSING

Janet W. Campbell *In its* Chesapeake Bay Plume Study Oct. 1981 p 501-502 (For primary document see N82-10661 01-48)
Avail: NTIS HC A22/MF A01 CSCL 08C

The state-of-the-art advancements in remote sensor technology due to the Superflux program are examined. Three major individual sensor technologies benefitted from the program: laser fluorosensors, optical-range scanners, and passive microwave sensors. Under Superflux, convincing evidence was obtained that the airborne oceanographic lidar fluorosensor can map chlorophyll, i.e., is linear, over a wide range from less than 0.5 to 5.0 mg/cu m. The lidar oceanographic probe dual-excitation concept for addressing phytoplankton color group composition was also demonstrated convincingly. Algorithm development, real time capabilities, and multisensor integration are also addressed. M.G.

N82-10695*# National Marine Fisheries Service, Highlands, N.J.

ASSESSMENT OF SUPERFLUX RELATIVE TO FISHERIES RESEARCH AND MONITORING

James P. Thomas *In* NASA. Langley Research Center Chesapeake Bay Plume Study Oct. 1981 p 503-515 refs (For primary document see N82-10661 01-48)
Avail: NTIS HC A22/MF A01 CSCL 08C

Some of the findings of the Superflux program relative to fishery research and monitoring are reviewed. The actual and potential influences of the plume on the shelf ecosystem contiguous to the mouth of Chesapeake Bay are described and insights derived from the combined use of in situ and remotely sensed data are presented. M.G.

N82-10696# Naval Postgraduate School, Monterey, Calif. Dept. of Oceanography.

SEA LEVEL VARIATIONS IN GULF OF THAILAND M.S. Thesis

Vichai Punpuk Mar. 1981 150 p refs
(AD-A103004) Avail: NTIS HC A07/MF A01 CSCL 08/3

From a study of low-pass filtered hourly sea levels for Sattahip and Ko-Lak in the northern Gulf of Thailand during the period 1960 through 1966, the sea level variations due to meteorological effects are found. The mean annual variation of the filtered sea level, which averages 0.5 meters, is consistent with the climatological mean annual wind variations. This sea level change appears to be a response to the Ekman transport which would be expected from the seasonal monsoon wind regimes. Sea level response to atmospheric pressure is negligible compared with response to wind. Analyses performed to find relations between the filtered sea level and the gulf-wide geostrophic wind and local surface wind show that the sea level slopes upward across the gulf in the same direction as the local wind blows, the response being coherent in the frequency band 0.083-0.117 cycles per day (period 8 to 12 days). This wind set-up effect is clearly secondary to the Ekman transport in inducing the seasonal sea level variations observed in the gulf. GRA

N82-10697# Naval Oceanographic Office, Bay St. Louis, Miss.

ICAPS OCEANOGRAPHIC DATA FOR THE PACIFIC OCEAN Final Report

Dec. 1980 174 p
(AD-A103439; NOO-RP-32B) Avail: NTIS HC A08/MF A01 CSCL 08/10

The Integrated Command ASW Prediction System (ICAPS) oceanographic data files for the Pacific Ocean are presented. These graphic displays provide an illustration of the historical data stored within the ICAPS data base. Depth, temperature, and salinity values are shown on a split-depth scale providing a detailed depiction of the near-surface structure and a less detailed picture of the slowly varying deeper structure. The corresponding oceanographic data for the Atlantic Ocean and Mediterranean Sea and Indian Ocean are presented in companion publications. Author (GRA)

N82-10698# Naval Ocean Research and Development Activity, Bay St. Louis, Miss. Environmental Simulation Branch.

A SUMMARY OF PAPERS RELATED TO MESOSCALE AND LARGE-SCALE OCEAN MODELING, VOLUME 1

Harley E. Hurlburt Jun. 1981 93 p refs
(AD-A103540; NORDA-TN-109-Vol-1) Avail: NTIS HC A05/MF A01 CSCL 08/10

This technical note contains summaries of the important ideas and results from 13 papers related to mesoscale and large scale ocean modeling. Most of the papers represent major contributions to our understanding of the dynamics and energetics of mesoscale eddies and their interaction with ocean currents and with each other. Understanding the nature of flow instabilities associated with the generation and evolution of the eddies is an important aspect of the problem which receives much attention in these papers. Most of the numerical simulations utilized simple two-layer, eddy-resolving, quasi-geostrophic models; a small number used primitive equation models. Author (GRA)

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N82-10699*# BioTechnology, Inc., Falls Church, Va.
USSR SPACE LIFE SCIENCES DIGEST, VOLUME 1, NO. 3 Quarterly Review
Patricia M. Wallace Sep. 1980 41 p refs
(Contract NASw-3223)
(NASA-CR-164780) Avail: NTIS HC A03/MF A01 CSCL 06D

An overview of the developments and direction of the USSR Space Life Sciences Program is given. Highlights of launches, program development, and mission planning are given. Results of ground-based research and space flight studies are summarized. Topics covered include: space medicine and physiology; space biology; and life sciences technology. J.M.S.

N82-10700*# BioTechnology, Inc., Falls Church, Va.
USSR SPACE LIFE SCIENCES DIGEST, VOLUME 1, NO. 4 Quarterly Review
Lyn D. Paulson Dec. 1980 65 p refs
(Contract NASw-3223)
(NASA-CR-164781) Avail: NTIS HC A04/MF A01 CSCL 06D

An overview of the developments and direction of the USSR Space Life Sciences Program is given. Highlights of launches, program development, and mission planning are given. Results of ground-based research and space flight studies are summarized. Topics covered include: space medicine and physiology; space biology, and life sciences and technology. J.M.S.

N82-10701*# BioTechnology, Inc., Falls Church, Va.
USSR SPACE LIFE SCIENCES DIGEST, VOLUME 2, NO.1 Quarterly Review
Lyn D. Paulson Mar. 1981 50 p refs
(Contract NASw-3223)
(NASA-CR-164782) Avail: NTIS HC A03/MF A01 CSCL 06D

An overview of the developments and direction of the USSR Space Life Sciences Program is given. Highlights of launches, program development, and mission planning are given. Results of ground-based research and space flight studies are summarized. Topics covered include: space medicine and physiology; space biology; and life sciences technology. J.M.S.

N82-10702*# BioTechnology, Inc., Falls Church, Va.
USSR SPACE LIFE SCIENCES DIGEST, VOLUME 2, NO. 2 Quarterly Review
Lyn D. Paulson Jun. 1981 48 p refs
(Contract NASw-3223)
(NASA-CR-164783) Avail: NTIS HC A03/MF A01 CSCL 06D

An overview of the developments and direction of the USSR Space Life Sciences Program is given. Highlights of launches, program development, and mission planning are given. Results of ground-based research and space flight studies are summarized. Topics covered include: space medicine and physiology; space biology; and life sciences and technology. J.M.S.

N82-10703# Woods Hole Oceanographic Institution, Mass. Dept. of Chemistry.
THE TRACE ELEMENT GEOCHEMISTRY OF MARINE BIOGENIC PARTICULATE MATTER Ph.D. Thesis
Robert William Collier Feb. 1981 304 p refs
(Contract N00014-80-C-0273; Grant NSF DES-75-03826)
(AD-A095300; WHOI-81-10) Avail: NTIS HC A14/MF A01 CSCL 08/1

Plankton samples were investigated for physical and chemical leaching decomposition to identify the major and trace element composition of particulate carrier phases. The identification of trace element/major element ratios in the biogenic materials was emphasized. The majority of the trace elements in the samples were directly associated with the nonskeletal organic phases of the plankton. Calcium carbonate and opal were not significant carriers for any of the trace elements studied. A refractory phase containing Al and Fe in terrigenous ratios was present in all samples, even from the more remote marine locations. E.A.K.

N82-10704# Columbia Univ., New York. Radiological Research Lab.
RADIATION PHYSICS, BIOPHYSICS AND RADIATION BIOLOGY Progress Report, 1 Oct. 1980 - 30 Sep. 1981
Jul. 1981 302 p refs
(Contracts DE-AC02-78EV-04733; EP-78-S-02-4733)
(DE81-025259; DOE/EV-04733/T1; COO-4733-4) Avail: NTIS HC A14/MF A01

Separate abstracts were prepared for the 29 papers in this progress report which deal with radiobiological physics, the biological effects of ionizing radiations, and the modification of these effects by chemical and pharmacological agents. DOE

N82-10705# Roscoe B. Jackson Memorial Lab., Bar Harbor, Maine.
INBORN ANEMIAS IN MICE Progress Report, 1 Aug. 1980 - 1 Jun. 1981
Seldon E. Bernstein, Jane E. Barker, and Elizabeth S. Russell Jun. 1981 36 p
(Contract DE-AC02-76EV-03264)
(DE81-029128; DOE/EV-03264/20) Avail: NTIS HC A03/MF A01

Four macrocytic anemias, five hemolytic anemias, nonhemolytic microcytic anemia, transitory siderocytic anemia, sex-linked iron-transport anemia, and a target-cell anemia were studied. Each of these blood dyscrasias is caused by the action of a unique mutant gene, which determines the structure of different intracellular molecules, and thus controls a different metabolic process. Each anemia was studied through: characterization of peripheral blood values, determinations of radiosensitivity under a variety of conditions, measurements of iron metabolism and heme synthesis, histological and biochemical study of blood-forming tissue, functional tests of the stem cell component, examination of responses to erythroid stimuli, and transplantation of tissue between individuals of differently affected genotypes. DOE

N82-10706# Argonne National Lab., Ill. Chemistry Div.
MODEL SYSTEMS IN PHOTOSYNTHESIS RESEARCH
Joseph J. Katz and J. C. Hindman 1980 12 p refs Presented at the 5th Intern. Photosyn. Congr., Halkidiki, Greece, 7-13 Sep. 1980 Submitted for publication
(Contract W-31-109-eng-38)
(DE81-023889; CONF-800963-7) Avail: NTIS HC A02/MF A01

Recently developed models in photosynthesis are described. The Mg-tris(pyrochlorophyllide)1,1,1-tris(hydroxymethyl) ethane triester in its folded configuration is a rudimentary antenna photoreaction center model. Self assembled chlorophyll systems that contain a mixture of monomeric, oligomeric and special pair chlorophyll are shown to have fluorescence emission characteristics. It is suggested that energy transfer between different chlorophyll species in these systems is more complex than previously suspected. DOE

52 AEROSPACE MEDICINE

Includes physiological factors, biological effects of radiation; and weightlessness.

N82-10707 Tulane Univ., New Orleans, La.
A HOMEOMORPHIC FINITE ELEMENT MODEL OF IMPACT HEAD INJURY Ph.D. Thesis
Ronald Richard Hosey 1981 235 p
Avail: Univ. Microfilms Order No. 8118368

A finite element model of the human head and neck, as a system, is presented which incorporates the brain and skull models of previous investigators and a model of the cervical spine into a single model. The exact geometry of the cerebrospinal fluid (CSF) space is included, and morphological continuity of the CSF space and brain material in the region of the head/spine connection is maintained in order that the proper flow of material between the head and spinal cavity may take place during a

simulated head impact or whiplash. The 3-dimensional geometry of the brain, spinal cord, CSF space, cervical vertebrae, and the intervertebral disks is defined by means of eight-node, isoparametric brick elements. Dissert. Abstr.

N82-10708 Loyola Univ., Chicago, Ill.
THE ROLE OF SKIN TEMPERATURE IN THE CONTROL OF SWEATING IN MAN Ph.D. Thesis
Thomas Vincent McCaffrey 1981 126 p
Avail: Univ. Microfilms Order No. 8119982

The role of cutaneous thermal receptors in the control of thermoregulatory sweating in men and particularly the specialized role of the head skin temperature in thermoregulatory sweating was investigated. It is suggested that tympanic membrane temperature, and oral temperature, may be affected by thermal exchange occurring between the arteries and veins in the cervical and cephalic regions. Sweating rate increases when head skin temperature increases and when the tympanic membrane and oral temperatures begin to rise. When head skin temperature decreases tympanic membrane and oral temperatures decreases and sweating rate followed the changes in skin temperature as well as the changes in tympanic membrane and oral temperatures. It is shown that head skin temperature is important in determining thermal comfort and sweating rate when compared to other body regions. It is suggested that this sensitivity is in part due to a thermal counter-current exchange between venous blood draining the head and arterial blood ascending to intracranial thermal receptors. Dissert. Abstr.

N82-10709* National Aeronautics and Space Administration, Washington, D. C.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY (SUPPLEMENT 223)
Sep. 1981 42 p
(NASA-SP-7011(223)) Avail: NTIS HC A03 CSCL 06E

This bibliography lists 92 reports, articles, and other documents introduced into the NASA scientific and technical information system in August 1981. Author

N82-10710# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.
A COMPUTATIONAL THEORY OF VISUAL SURFACE INTERPOLATION
W. E. L. Grimson Jun. 1981 77 p refs
(Contract N00014-80-C-0505; Grant NSF MCS-77-07569)
(AD-A103921; AI-M-613) Avail: NTIS HC A05/MF A01 CSCL 06/4

A computational theory of the interpolation of surfaces from visual information is presented. However, the surface must agree with the information from stereo or motion correspondence, and not vary radically between these points. Using the image irradiance equation, an explicit form of this surface consistency constraints is derived and a functional from the space of functions to the real numbers is required. Conditions on the form of the functional are derived. It is concluded that if the functional is a complete seminorm which satisfies the parallelogram law, or the space function is a semi-Hilbert space and the functional is a semiinner product, then there is a unique surface which is most consistent with the visual information. E.A.K.

N82-10711# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.
COLOR VISION AND IMAGE INTENSITIES: WHEN ARE CHANGES MATERIAL?
John M. Rubin and W. A. Richards May 1981 34 p refs
(Contract N00014-80-C-0505; Grant NSF MCS-79-23110)
(AD-A103926; AI-M-631) Avail: NTIS HC A03/MF A01 CSCL 05/1

A preliminary goal for color vision to determine where changes of material occur in a scene, using only spectral information was analyzed. It is posted that the effects of many processes are confounded with the effects of material changes in the available image intensities and material changes are essentially arbitrary. A unique condition, the spectral crosspoint, allows rejection of hypothesis that measured image intensities arise from one of the confounding processes. Image intensities are measured from regions on opposite sides of an edge. The biological visual system interprets spectral crosspoints across edges as material changes. A circularly symmetric operator is designed to detect crosspoints which resemble the double opponent cell which is commonplace in biological color vision systems. E.A.K.

N82-10712# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.
EVIDENCE RELATING SUBJECTIVE CONTOURS AND INTERPRETATIONS INVOLVING OCCLUSION
Kent A. Stevens Jun. 1981 14 p refs
(Contract N00014-80-C-0505; Grant NSF MCS-79-23110)
(AD-A103925; AI-M-637) Avail: NTIS HC A02/MF A01 CSCL 06/16

Subjective contours, according to one theory, outline surfaces that are apparently interposed between the viewer and background (because of the disruption of background figures, sudden termination of lines, and other occlusion 'cues') but are not explicitly outlined by intensity discontinuities. This theory predicts that if occlusion cues are not interpreted as evidence of occlusion, no intervening surface need be postulated, hence no subjective contours would be seen. This prediction, however, is difficult to test because observers normally interpret the cues as occlusion evidence and normally see the subjective contours. This article describes a patient with visual agnosia who is both unable to make the usual occlusion interpretations and is unable to see subjective contours. He has, however, normal ability to interpret standard visual illusions, stereograms, and in particular, stereogram versions of the standard subjective contour figures, which elicit to him strong subjective edges in depth (corresponding to the subjective contours viewed in the monocular versions of the figures). Author (GRA)

N82-10713# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.
EQUATION COUNTING AND THE INTERPRETATION OF SENSORY DATA
W. A. Richards, J. M. Rubin, and D. D. Hoffman 6 Jun. 1981 27 p refs
(Contract N00014-80-C-0505; Grant NSF MCS-79-23110)
(AD-A103924; AI-M-614) Avail: NTIS HC A03/MF A01 CSCL 06/16

Many problems in biological information processing require the solution to a complex system of equations in many unknown variables. An equation-counting procedure is described for determining whether such a system of equations will indeed have a unique solution, and under what conditions the solution should be interpreted as correct. Three examples of the procedure are given for illustration, one for auditory signal processing and two from vision. Author (GRA)

N82-10714# Research Inst. of National Defence, Stockholm (Sweden). Huvudavdelning 5.
A HUMAN BEING IN THE SEA. PART 2: DEVELOPMENT TRENDS IN SUBMARINE TECHNOLOGY [MAANNISKAN I HAVET 2. UTVECKLINGSTENDENSER INOM UNDERVATTENSOMRAADET]
Bo Cassel Sep. 1980 37 p In SWEDISH
(FOA-C-58008-H3-Pt-2) Avail: NTIS HC A03/MF A01

Methods and techniques are reviewed for diving applicances including: diving suits for divers exposed to pressure; selfcontained diving apparatus; rigid diving apparatus and diving bells; rescue techniques, especially for long term stays in case of emergency; submarines with crew or without crew; tools; and technical development of the resources of the sea bottom. Description of easily transportable deep underwater diving apparatuses in standard containers is given. Methods to evacuate divers under pressure to pressure-chambers on land are discussed. Author (ESA)

N82-10715# Research Inst. of National Defence, Umea (Sweden). Huvudavdelning 4.
CADMIUM ANALYSIS IN VIVO [KADMIUM-ANALYS IN VIVO]
Ronny Bergman Dec. 1980 25 p refs In SWEDISH
(FOA-C-40126-W4(C3)) Avail: NTIS HC A02/MF A01

A method for quick selective analysis of the cadmium content in organs like kidneys and the liver with the use of neutron activation was developed. The method is based on the measurement of prompt gamma radiation emitted by the neutron

absorption in the Cd 113 isotope. The sensitivity of the analysis is high. With neutrons in the intermediate energy interval, 1 to 100 KeV, organs at different distances in the body are selectively analyzed. The amount of cadmium in the kidneys of normal people are analyzed with sufficient accuracy so that the dose in the most exposed tissues does not exceed 40 mrad, of which more than half are from gamma rays. With cadmium amounts higher than the normal in the kidney tissues, the doses decrease proportionnaly. Author (ESA)

N82-10716# Medical Physics Inst. Utrecht (Netherlands).
[MEDICAL RESEARCH ACTIVITIES IN THE NETHERLANDS] Progress Report
B. vanEijnsbergen, ed. and F. H. LopesdaSilva, ed. Dec. 1980 154 p refs
(TNO-MFI-PR-7) Avail: NTIS HC A08/MF A01

Several aspects of medical physics are reported. Topics include: the brain (work on epileptiform transients; recording of responses via implanted electrodes; EEG monitoring during open heart surgery; and models related to the generation of propagated alpha rythmic activity); and the heart and lungs (computerized and microcomputerized) monitoring of parameters. Author (ESA)

N82-10717# Department of Agriculture, Washington, D.C. National Economics Div.
ENERGY EXPENDITURE AND DIETARY CHANGE
Larry G. Traub and Thomas A. Stucker May 1981 27 p refs (PB81-218471; AGESS-810512) Avail: NTIS HC A03/MF A01 CSCL 10A

Comparative expenditures for food and costs of energy in the food system under alternative diets was studied. The types of diet analyzed are: the current average diet consumed; and a diet consistent with specifications of the dietary guidelines. It is shown that the greatest savings under a diet altered to conform with the dietary guidelines is in electrical generation, and the least energy savings in refined petroleum use. GRA

N82-10718 Ohio State Univ., Columbus.
CARDIORESPIRATORY RESPONSES AND HANDGRIP ISOMETRIC COMPONENT FOR VARIOUS WHEELCHAIR PROPULSION SYSTEMS Ph.D. Thesis
Douglas Peter Beal 1981 182 p
Avail: Univ. Microfilms Order No. 8115083

Three types of wheelchair propulsion systems for cardiorespiratory responses normal synchronous (sync) handrim propulsion, an asynchronous (async) system of application of force to the handrims, and an arm crank system of propulsion were studied. The static exercise component of the handgrip muscles for these three methods of wheelchair propulsion were compared and a test protocol which measures these variables under equivalent conditions at submaximal and maximal power output (PO) levels, on both able bodied (AB) and wheelchair dependent (WD) subjects was employed. It is found that the static component directly related to the relative intensity of each exercise mode. Similar static components were found for sync and async handrim propulsion, whereas a higher static component was found for arm cracking. It is indicated that the sync propulsion method is slightly more stressful than the async method, and that the arm crank propulsion system significantly reduces the stresses associated with wheelchair locomotion. Dissert. Abstr.

N82-10719 Florida State Univ., Tallahassee.
THE EFFECTS OF COLD- AND EXERCISE-INDUCED ALTERATIONS IN SKIN AND CORE TEMPERATURE ON SUBSTRATE MOBILIZATION AND UTILIZATION Ph.D. Thesis
Bernard F. Hurley 1981 134 p
Avail: Univ. Microfilms Order No. 8117944

The effects of altering skin and core temperature by cold exposure and exercise on substrate mobilization and utilization were examined. The significance of the effects of skin and core temperatures on the variables of interest was determined. It is indicated that free fatty acid, glucose, lactate, hemoglobin, and hematocrit concentrations significantly increase during rest when both mean skin temperature and rectal temperature are induced. It is concluded that reductions in both skin temperature and rectal temperature are necessary during cold exposure to produce increases in substrates, hemoconcentration, lactate, and oxygen consumption. Fat mobilization and utilization occurs during exercise in the cold only if reductions in both skin and rectal temperature are produced. Dissert. Abstr.

N82-10720# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
PHYSIOPATHOLOGY AND PATHOLOGY OF SPINAL AILMENTS IN AEROSPACE MEDICINE [PHYSIOPATHOLOGIE AT PATHOLOGIE DES AFFECTION DUR RACHIS EN MEDECINE AEROSPATIALE]
R. P. Delahaye, R. Auffret, P. Doury, C. Kleitz, A. Leger, G. Leguay, P. J. Metges, J. L. Poirier, B. Vettes, and H. Viellefond Apr. 1981 336 p refs In FRENCH
(AGARD-AG-250-FR; ISBN-92-835-2108-0) Avail: NTIS HC A15/MF A01

Spinal problems in aerospace medicine are reviewed. Opinions are expressed in the areas of etiology, diagnosis and prognosis for lesions in the spinal column, injuries which are activated by piloting rotary wing aircrafts, conventional airplanes, gliders, or by parachute jumping. It is concluded that this information is helpful in aerospace medicine, the medical physiology of flying personnel, and also in the enforcment of flight safety.
Transl. by E.A.K.

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

No abstracts in this category.

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N82-10721# Virginia Polytechnic Inst. and State Univ., Blacksburg. Computer Science, Industrial Engineering/Operations Research.
A MONTE-CARLO SIMULATION INVESTIGATING MEANS OF HUMAN-COMPUTER COMMUNICATION FOR DYNAMIC TASK ALLOCATION
Mark E. Revesman Aug. 1981 39 p refs Presented at the IEEE Intern. Conf. on Cybernetics and Soc., Atlanta, Oct. 1981 Submitted for publication
(Contract N00014-81-K-0143)
(AD-A103890; CSIE-81-1) Avail: NTIS HC A03/MF A01 CSCL 05/8

This paper investigates human-computer communication in multitask decision making situations. It is proposed that tasks in these systems be allocated in a dynamic manner. Communication between human and computer is essential for dynamic allocation to enhance system performance. Simulation experiments investigate two modes of communication: implicit, in which the human's planned actions are relayed to the computer by the use of model of the human's decision strategy , and explicit, in which the human overtly describes his decisions to the computer. Results indicate that implicit communication can significantly enhance system performance if the computer uses a method of decision making which complements that of the human. Explicit communication can greatly enhance system performance, but there is an inherent cost in the time it takes the human to transmit his decisions to the computer. It is concluded that the costs of both methods can be traded off so that either implicit or explicit communication may be useful in different situations. Further research is suggested for defining complementary strategies using human models and for investigating trade-offs between implicit and explicit communication. Author (GRA)

N82-10722# Research Inst. of National Defence, Umea (Sweden). Huvudavdelning 4.
THE INFLUENCE OF BEARD, BEARD-STUBBLE AND AGE WRINKLES ON THE ADJUSTMENT OF PROTECTIVE MASKS [INVERKAN AV SKAEGG, SKAEGGSTUBB OCH AALDERSRYNKOR PAA SKYDDSMASKTILLPASSNING]
Per-Gunnar Joensson Nov. 1980 32 p refs In SWEDISH (FOA-A-40034-C2/A2/ B2) Avail: NTIS HC A03/MF A01

Tests were conducted with eight different types of respirators on 31 men, newly shaven and then after 8, 24, 48 and 96 hours of beard growth. Two types of safety devices covering nose and mouth, i.e., four complete gas masks and two with pressurized air, were investigated. With three of these masks a notable worsening in the adjustment is noticeable after only eight hours beard growth. The same eight protective devices were also tested on 20 full-bearded men. No satisfactory protection is recorded. Wrinkled skin can also lead to a less favorable performance. The influence of this factor was tested on 56 retired men and women with two safety devices covering nose and mouth and four different gas masks. The adjustment is significantly less tight than on younger persons. Author (ESA)

55 PLANETARY BIOLOGY

Includes exobiology and extraterrestrial life.

No abstracts in this category.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

N82-10723*# Bendix Corp., Teterboro, N. J. Flight Systems Div.
MEASUREMENT OF FAULT LATENCY IN A DIGITAL AVIONIC MINIPROCESSOR Progress Report
John G. McGough and Fred L. Swern Oct. 1981 206 p refs (Contract NAS1-15946)
(NASA-CR-3462) Avail: NTIS HC A10/MF A01 CSCL 12A

The results of fault injection experiments utilizing a gate-level emulation of the central processor unit of the Bendix BDX-930 digital computer are presented. The failure detection coverage of comparison-monitoring and a typical avionics CPU self-test program was determined. The specific tasks and experiments included: (1) inject randomly selected gate-level and pin-level faults and emulate six software programs using comparison-monitoring to detect the faults; (2) based upon the derived empirical data develop and validate a model of fault latency that will forecast a software program's detecting ability; (3) given a typical avionics self-test program, inject randomly selected faults at both the gate-level and pin-level and determine the proportion of faults detected; (4) determine why faults were undetected; (5) recommend how the emulation can be extended to multiprocessor systems such as SIFT; and (6) determine the proportion of faults detected by a uniprocessor BIT (built-in-test) irrespective of self-test. J.M.S.

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.
For components see *33 Electronics and Electrical Engineering*.

N82-10724 Texas Univ. at Arlington.
A COMPUTER ARCHITECTURE WITH HARDWARE OPERATING SYSTEM FEATURES FOR COMMUNICATIONS PROCESSING Ph.D. Thesis
Gene Charles Barton 1981 224 p
Avail: Univ. Microfilms Order No. 8119256

Computer and operating system design features are examined and evaluated with respect to their utility in a communications environment. Then, an architecture which fulfills these requirements is presented. The proposed architecture includes hardware operating system features which largely eliminate the multiprogramming difficulties normally encountered in communications applications. In particular, scheduling context switching and protection are implemented in such a way that no overhead is imposed. The protection concept of a sentry is introduced and implemented in a way that is fault tolerant and fail safe.
Dissert. Abstr.

N82-10725 New Mexico State Univ., Las Cruces.
ON-LINE FAULT DIAGNOSTICS OF MULTIPLE MICROPROCESSOR SYSTEMS Ph.D. Thesis
Hsin Chia Fu 1981 128 p
Avail: Univ. Microfilms Order No. 8117751

An on-line fault diagnostic architecture is introduced that utilizes a built-in-test microprocessor to monitor the operating behavior of an array of microprocessors in a multiprocessor system. The multiprocessor architecture consists of a host computer, a bus processor, a built-in-test-processor (BITP), and an array of slave processors interconnected by communication units. Having access to the internal bus of all slave processors, the BITP can record and analyze the activity on any slave processors's bus for possible errors. An analytical fault diagnostic net (FDN) model is formulated to characterize the relationships between the recorded activity and the type of faults to be diagnosed. Algorithms and theorems are derived for a functional FDN (an FDN that is completely diagnosable) of a microprocessor system. A complete description of a prototype built-in-test system that utilizes the FDN model is presented. A discussion is given to describe a generalized application of the FDN concept for different microprocessor systems. Dissert. Abstr.

N82-10726 Pennsylvania Univ., Philadelphia.
INFORMATION PRESENTATION THROUGH DEFAULT DISPLAYS Ph.D. Thesis
Sakunthala Gnanamgari 1981 118 p
Avail: Univ. Microfilms Order No. 8117783

Graphic presentation of tabular data is considered. An intelligent system which helps users in the graphical display of data by performing the task of a graphic artist is developed. The gap between the way a user and the machine is considered. The automatic selection of graphic display formats is developed, based on the formally characterizable properties of the data to be displayed, the user's particular objectives, principles of graphic design, and the results of studies in the area of human factors and effective displays. Dissert. Abstr.

N82-10727 University of Central Florida, Orlando.
AN ASSOCIATIVE BACKEND MACHINE FOR DATA BASE MANAGEMENT Ph.D. Thesis
Alireza Hurson 1980 393 p
Avail: Univ. Microfilms Order No. 8118424

A backend machine architecture ASLM (Associative Search Language) was developed. The language is directly executed by the backend machine using built-in hardware algorithms for query processing and associative hardware for name-space resolution. The language ASL is a high level data base language using associative principles for basic operations and defined by the relational data model. The ASLM is designed based on cellular organization. In the design of ASLM, the processing units (cells) are moved into the backend machine. The general strategy in ASLM is based on the pre-search through the data file and then the execution of the operation on the explicit subfiles which are stored in the associative memory. The ASLM is microprogrammable. The separation of the cells in the ASLM from the secondary storage results in a cost effective system in comparison to the other machines and eliminates any restriction on the secondary devices. Dissert. Abstr.

N82-10728 Texas Univ. at Arlington.
A COMPUTER ARCHITECTURE FOR LOGIC SIMULATION Ph.D. Thesis
Rondey Lange Barto 1980 125 p
Avail: Univ. Microfilms Order No. 8119405

A computer architecture optimized for logic simulation was designed and validated, and examples of its operation given. The computer has its memory system and data paths designed around the data structures of a logic simulator, and incorporates dedicated processors to perform the required simulator functions. A possible hardware implementation using commercially available components was presented, and its cost and performance estimated. These were shown to compare favorably to the cost and performance of a programmed logic simulator.
Dissert. Abstr.

N82-10729 Case Western Reserve Univ., Cleveland, Ohio.
THEORETICAL BASIS FOR REDUCTION OF CROSS-TALK IN ASSOCIATIVE MEMORY RECOGNITION OF PATTERNS: WITH RESULTING DECREASE IN PROCESSING TIME AND COMPUTER STORAGE REQUIREMENTS Ph.D. Thesis
Gert Paul Hartoch 1981 117 p
Avail: Univ. Microfilms Order No. 8118798

An information storage and retrieval procedure capable of efficiently storing away a large number of individual facts and later retieving these facts in a very rapid manner, was developed. A large training set of reference patterns is clustered via an automatic, self-adaptive clustering algorithm to generate a multi-tiered, multi-branched hierarchical tree structure. The reference patterns at the nodes of the hierarchical tree structure were encoded into associative memories using Walsh function encoding techniques. An algorithm to minimize the associative memory noise was developed. The procedure is easily adaptable to a large variety of classes of data. It presents a very rapid and storage efficient pattern recognition tool when test patterns are to be identified by a similarity measure. Dissert. Abstr.

N82-10730# Georgia Inst. of Tech., Atlanta. School of Information and Computer Science.
RESEARCH PROGRAM IN FULLY DISTRIBUTED PROCESSING SYSTEMS Quarterly Progress Report, 1 Mar. - 31 May 1981
Jun. 1981 15 p refs
(Contracts N00014-79-C-0873; F30602-78-C-0120; DAAG29-79-C-0155; DAAK70-79-D-0087; Grant NSF MCS-79-24370)
(AD-A103009; QPR-7) Avail: NTIS HC A02/MF A01 CSCL 09/2

A comprehensive data processing system, in which both physical and logical components are loosely coupled while operating with a high degree of control autonomy at the component level, is described. The definition of the specific class of multiple computer systems is investigated. The operational characteristics of the systems is to advance the state-of-the-art which delivers a high proportion of the benefits claimed by distributed processing systems. Formal modeling and theoretical studies to empirical examinations of prototype systems and simulation models are presented. E.A.K.

N82-10731# Bunker-Ramo Corp., Arlington, Va.
MICROPROCESSOR FRONT-END TERMINAL STUDY Final Technical Report, May 1980 - Mar. 1981
Raymond Arnold and Ward Neely Griffiss AFB, N.Y. RADC Jun. 1981 158 p refs
(Contract F30602-80-C-0182; AF Proj. 5581)
(AD-A104171; RADC-TR-81-149) Avail: NTIS HC A08/MF A01 CSCL 09/2

The objective of this effort was the definition and description of a modular intelligent display terminal for the TACS system which incorporates a programmable microprocessor as a front-end to handle communication and teleprocessing interfaces and protocols. The unit should be able to function as a stand-alone terminal, as a terminal to a processing facility or as an independent mode on a network of data processing systems. The main emphasis of the system analysis was JINTACCS messages at the Wing Level although other messages and levels are also included.
Author (GRA)

N82-10732# Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision Systems.
QUERY PROCESSING IN DISTRIBUTED DATA BASES
Victor O. K. Li (Southern California Univ.) Jul. 1981 23 p refs
(Contract N00014-77-C-0532; NR Proj. 041-519)
(AD-A103826; LIDS-P-1107) Avail: NTIS HC A02/MF A01 CSCL 09/2

This paper describes two new distributed query processing algorithms. The MST Algorithm minimizes the total communication costs associated with a query while the MDT Algorithm minimizes the response time. These two algorithms are easy to analyze and to implement, since they are based on the minimum spanning tree and the shortest path problems, for which numerous algorithms exist. In addition, these two algorithms can be implemented using distributed computation, i.e., each node using only information available from adjacent nodes. We also develop the 'artificial file node' technique to extend existing query processing algorithms which are designed for non-redundant databases to that for general, redundant databases. The two algorithms are illustrated by simple examples. Author (GRA)

N82-10733# Siemens A.G., Munich (West Germany). Hauptbereich Anwendungstechnik.
DEVELOPMENT OF HARDWARE CONCEPTS FOR INTERACTIVE VIDEOTEX Final Report
Wilhelm Bosselmann, Ladislav Bunata, Reinhard Fischer, Heinrich Kammerhofer, Wolfgang Kampczyk, and Erik Langer Bonn Bundesministerium fuer Forschung und Technologie Nov. 1980 106 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-80-118; ISSN-0340-7608) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 22.30

The execution of system comparisons for interactive and broadcast videotex shows that, with respect to the existing requirements on system performance, the hardware for the decoders in television receivers has to be different. The compatibility of the hardware can either be obtained by canceling the character row and television line, or by degradation of the interactive videotex system. With respect to the modem, the greatest difficulties arise from dc feeding by the telephone line. The necessary filters can be integrated; their power consumption has a great influence on the concept. Author (ESA)

N82-10734# Danish Research Center for Applied Electronics, Hoersholm.
PRACTICES AND TECHNIQUES FOR EFFICIENT SOFTWARE DEVELOPMENT FOR MICROCOMPUTERS. PROGRAMMING LANGUAGES, SOFTWARE DEVELOPMENT TOOLS AND SYSTEMS AS DEVELOPED AND USED BY 12 ELECTRONICS COMPANIES AND UNIVERSITIES IN THE UNITED STATES
Christen Monberg and Stig Skelboe Dec. 1980 37 p refs Sponsored by Danish Council of Technology
(ECR-105) Avail: NTIS HC A03/MF A01

Information on currently used techniques and trends in software development was collected. Visits were made to 12 companies and universities in the United States. The main areas of interest explored were: programming language (assembly language, high level languages and domain specific languages); development systems; software management, planning, and testing; software environment and tools; and operating systems.
Author (ESA)

N82-10735# British Gas Corp., Newcastle-upon-Tyne (England). Engineering Research Station.
MICROPROCESSOR APPLICATIONS FOR THE MONITORING AND CONTROL OF GAS SUPPLIES
R. S. Davidson and T. M. Sporton Nov. 1980 11 p Presented at IMEKO/IFAC Symp. on Appl. of Microprocessors in Devices for Instrumentation and Automatic Control, London, 17-20 Nov. 1980
(ERS-E-276) Avail: NTIS HC A02/MF A01

The potential of the microprocessor to replace many established electromechanical and pneumatic systems and to solve problems which could be tackled previously only by main-frame computers is discussed. Applications already in use and ideas

under development are detailed. These include telemetry systems used for controlling and monitoring gas supplies, controlling the monitoring of a reversible liquid natural gas process for meeting peak demand on a seasonal basis, a system incorporating a microprocessor for gas holder monitoring and control, and a prototype microprocessor control system for gas distribution governors. Author (ESA)

N82-10736# Engins Matra, Velizy (France).
COMPARISON OF 16 BIT MICROPROCESSORS: MOTOROLA MC 68000 AND INTEL 8086 [COMPARISON DES MICROPROCESSEURS 16 BITS: MOTOROLA MC 68000 ET INTEL 8086]
Claude Abin 13 Apr. 1981 32 p In FRENCH
(DEL/CA/337) Avail: NTIS HC A03/MF A01

The most significant characteristics of the two devices are compared. These include packaging, address space, internal architecture, mode of address, instruction sets, interruptions, performance, and peripherals. Comparison shows advantages for the 68000 over the 8086 as to internal architecture. On the other hand, the 8086 with the 8087 coprocessor is considerably more powerful. The two families of peripheral circuitry offer more or less similar functions, although under different forms, with performance being on the same order of magnitude.
Author (ESA)

N82-10737# Federal Compiler Testing Center, Falls Church, Va. Software Development Office.
DATA GENERAL CORPORATION AOS COBOL REVISION 3.10
15 Jun. 1981 50 p
(PB81-219206; CCVS74-VSR775) Avail: NTIS HC A03/MF A01 CSCL 09B

The validation summary report for the Data General AOS COBOL compiler version 3.10 (AOS version 3.39) is presented. A summary of the results obtained from the validation of the subject compiler against the 1974 COBOL standard is given.
GRA

N82-10738# Federal Compiler Testing Center, Falls Church, Va. Automated Data and Telecommunications Service.
COMPUTER SCIENCES CORPORATION CSTS 74 COBOL, VERSION COB230
15 Jun. 1981 68 p
(PB81-219214; CCVS74-VSR790) Avail: NTIS HC A04/MF A01 CSCL 09B

The Computer Sciences Corporation CSTS 74 COBOL compiler version COB230 (CSTS Version SYS200) was evaluated. A consolidated summary of the results obtained from the validation of the compiler against the 1974 COBOL standard is given.
GRA

N82-10739# Federal Compiler Testing Center, Falls Church, Va. Software Development Office.
NCR CORPORATION NCR IRX COBOL, RELEASE 4.0
15 Jun. 1981 49 p refs
(PB81-219222; CCVS74-VSR785) Avail: NTIS HC A03/MF A01 CSCL 09B

The Validation Summary Report (VSR) for the NCR Corporation IRX COBOL Compiler Compiler Version 4.0 (NCR IRX Version 4.0) provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The complier was validated at the Low-Intermediate level of DIPS PUB 21-1. The VSR is made up of several sections showing the discrepancies found. These include an overview of the validation which lists all categories of discrepancies between level/module within X3.23-1974, a section relating the categories of discrepancies to each of the Federal levels of the language; and a detailed listing of discrepancies together with the tests which were failed.
GRA

N82-10740# Federal Compiler Testing Center, Falls Church, Va. Software Development Office.
NCR CORPORATION NCR IRX COBOL, RELEASE 4.0 INDEXED 1-0 MODULE, LEVEL 1
15 Jun. 1981 10 p
(PB81-219230; FCTC/TR-81/18) Avail: NTIS HC A02/MF A01 CSCL 09B

This FCTC Technical Report for the indexed I-O Module of the NCR Corporation IRX COBOL Compiler Version 4.0 (NCR IRX Version 4.0) provides a consolidated summary of the results obtained from the evaluation of the subject compiler against the Indexed I-O Module of the 174 COBOL Standard (X323-1974/FIPS PUB 21-1). This technical report is made up of several sections showing the discrepancies found. A companion report (Validation Summary Report CCVS740VSR785) provides information regarding the validation of the Compiler at the Low-Intermediate level of Federal Standard COBOL (FIPS PUB 21-1).
GRA

N82-10741# Federal Compiler Testing Center, Falls Church, Va. Automated Data and Telecommunications Service.
COBOL COMPILER VALIDATION SYSTEM 1974. VERSION 4.1 USER'S GUIDE (IMPLEMENTATION DOCUMENT)
Jun. 1981 254 p refs
(PB81-219040; FCTC/CCVS74UG-81/17; GSA/DF-80/001B)
Avail: NTIS HC A12/MF A01 CSCL 09B

The information necessary to implement version 4.1 of the 1974 COBOL compiler validation system (CCVS) is documented. The 1974 CCVS consists of audit routines, their related data, and an executive routine (VP-routine) which prepares the audit routines for compilation. Each audit routine is a COBOL program which includes many tests and supporting procedures indicating the result of the tests.
GRA

N82-10742# Federal Compiler Testing Center, Falls Church, Va. Automated Data and Telecommunications Service.
COBOL COMPILER VALIDATION SYSTEM 1974. VERSION 4: EVALUATION GUIDE
Jun. 1981 149 p refs
(PB81-219057; FCTC/CCVS74EG-81/16; GSA/DF-80/001C)
Avail: NTIS HC A07/MF A01 CSCL 09B

A consolidation of checklists, guides, and supporting documents which aid the user of the 1974 COBOL compiler validation system when evaluating the results from testing a COBOL compiler for adherence to Federal standard is presented.
GRA

N82-10743# Federal Compiler Testing Center, Falls Church, Va. Automated Data and Telecommunications Service.
CONTROL DATA CORPORATION COBOL 5.3 LEVEL 540 CYBER 73, NOS/BE 1.4 LEVEL 530 Validation Summary Report
3 Jun. 1981 66 p refs
(PB81-213837; CCVS74-VSR766) Avail: NTIS HC A04/MF A01 CSCL 09B

The validation summary report for the CDC NOS/BE COBOL Compiler 5.3 Level 540 (NOS/BE 1.4 level 530) is presented. A consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL standard is given.
GRA

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N82-10744 Texas Univ. at Arlington.
A MODELING SYSTEM FOR MATHEMATICAL PROGRAMMING Ph.D. Thesis
Wilhelm Franz Burger 1981 179 p
Avail: Univ. Microfilms Order No. 8119266

The model formulation process and the data management aspects of the model data are examined for the case of linear programming (LP) models. A modeling system is presented which uses a unified language for expressing data definition, data manipulation, and model formulation constructs. A module mechanism is introduced in order to break the modeling task into sub-tasks that can be handled separately. In particular, model formulation and model data management are treated independently. An interactive environment is provided in order to support the design process of a model, and to allow the user to experiment with alternative problem solutions. A command

language is defined with which different modes of man-machine interaction can be initiated. Of importance is the browsing mode in which data definition and data manipulation facilities are available interactively. The browsing mode can be used to change or create data for different solutions, or it may be simply used to learn more about the data at hand. Dissert. Abstr.

N82-10745 Wisconsin Univ. - Madison.
ANALYSIS OF SPEEDUP IN DISTRIBUTED ALGORITHMS Ph.D. Thesis
John Philip Fishburn 1981 186 p
Avail: Univ. Microfilms Order No. 8116649

Several practical parallel algorithms for multicomputers were analyzed. Two distributed algorithms for implementing alpha beta search on a tree of processors are presented. For each algorithm, a theoretical model is developed that predicts speedup with arbitrary many processors. Iterative methods give rise to natural multicomputer algorithms. The numerical solution of elliptic partial differential equations are considered. The running time of the grid and the tree algorithms with respect to permessage overhead, perpoint communication time and perpoint computation time are derived. It is concluded that the larger the problem, the closer the algorithms approach optimal speedup. The application of the tree algorithms to nonuniform regions is shown. Dissert. Abstr.

N82-10746 Illinois Univ. at Urbana.
PERFORMANCE ANALYSIS OF UPDATE SYNCHRONIZATION ALGORITHMS FOR DISTRIBUTED DATABASES Ph.D. Thesis
Wing Kai Cheng 1981 248 p
Avail: Univ. Microfilms Order No. 8119634

Several update synchronization algorithms are modelled and analyzed. Algorithms investigated include a resilient centralized locking algorithm, some distributed algorithms using timestamps, and some algorithms using clock messages in addition to timestamps. Results from the analysis allow one to pinpoint inefficiency and suggest some algorithms. Dissert. Abstr.

N82-10747 Massachusetts Univ., Amherst.
USING COMPUTER GRAPHICS AS AN AID TO UNDERSTANDING SIMULATION DATA Ph.D. Thesis
Alan Charles Morse 1981 266 p
Avail: Univ. Microfilms Order No. 8118028

The design of a computer graphics system for more effective display computer simulation data is developed. The human factors of graphical data representation are analyzed. Possible coding schemes are described. The structure of modelling is analyzed and appropriate display coding methods and principles are determined and applied to a subclass of models, namely, those that involve neural simulations. A system for data display is outlined. The results of using such a system are described. Dissert. Abstr.

N82-10748 Massachusetts Univ., Amherst.
COMPUTER INTERPRETATION OF A DYNAMIC IMAGE FROM A VEHICLE Ph.D. Thesis
Thomas Dell Williams 1981 293 p
Avail: Univ. Microfilms Order No. 8118055

The design and implementation of a computer program that constructs an interpretation of images of a natural scene, in particular, one imaged while the camera is in a moving automobile, are discussed. The succession of images is interpreted in terms of sufaces and objects in three-dimensional space. The agreement between image dynamics and an internal surface model of the environment is measured by comparing a pair of temporally disparate images (two movie frames). Using the model, an image taken at one location can be transformed into a synthetic image of the scene as it would be viewed from another location. This synthesis accounts for point displacements and occlusion effects as predicted by the internal model. Differences between the real and the synthetic images are then used as an error measure in a search that refines the model. Once the model is refined, unresolved errors are used to correct the initial surface model by resegmenting the image into a better approximation of the surfaces in the environment. This surface model refinement is followed by an object identification phase. Size and color attributes measured from the derived internal model are compared with stored attributes for objects. Dissert. Abstr.

N82-10749 California Univ., Irvine.
A DATAFLOW ARCHITECTURE WITH IMPROVED ASYMPTOTIC PERFORMANCE Ph.D. Thesis
Robert Eugene Thomas 1981 90 p
Avail: Univ. Microfilms Order No. 8118493

The design of a computer comprising large numbers of small, inexpensive processors and based on the asynchronous and functional semantics of dataflow is presented. Processors within the machine are interconnected by a packet switched binary n cube although a limited number of other networks may be substituted with predictable asymptotic effects on performance. Improved performance of the proposed machine over a previously reported dataflow architecture is predicted in terms of the computational time complexity of several example programs: matrix multiply, quicksort, and iterative solutions to partial differential equations. Although the example programs are numerical in nature, the machine is intended for general purpose computation since programs are written in the high level dataflow language Id without knowledge of the number of processors or interconnections. Storage management and data communication methods are also presented which are necessary to obtain the improved performance. Experimental results from a simulated machine incorporating some of these methods are given to corroborate analytic results. Dissert. Abstr.

N82-10750 Texas A&M Univ., College Station.
MODEL ORDER AND PARAMETER IDENTIFICATION FROM LAYERED MEDIA RESPONSE DATA Ph.D. Thesis
Joel Nelson Holyoak 1981 198 p
Avail: Univ. Microfilms Order No. 8118270

The generation of a maximum likelihood estimation algorithm for the simultaneous solution of the order and the reflection coefficients of a reverberative, non-absorptive, horizontally stratified, layered media is discussed. The approach taken involves utilizing response data from both the input excitation as well as the response data from the layered media to form estimates of a composite model which includes the excitation model and the layered media model. This particular approach allows for simplifications that reduce the required computations in the maximum likelihood algorithm. A parallel processing scheme is presented which is based on the interlayer spacing of the reflecting layers. Interlayer spacing is used to form a class of models on which order determination procedures can be performed. The nature of the models is such that all lower-order model reflection layers are also reflection layers in all higher-order models. Two methods are developed for the solution of the maximum number of determinable reflection layers. Numerous examples are given to demonstrate estimation quality. Dissert. Abstr.

N82-10751 Polytechnic Inst. of New York, Brooklyn.
PARTITION STATISTICS IN IMAGE PROCESSING Ph.D. Thesis
Basil Palte Rabinowitz 1981 132 p
Avail: Univ. Microfilms Order No. 8118894

Extensions of partition statistics for problems in image processing are developed. The broad class of images that are represented by a discrete array of pixels is considered. The statistics presented find application in a wide variety of fields such as underwater sounding, radar, sonar and satellite photography. The extension of the Two Sample Linear m-Interval Partition Test and the Two Sample Quadratic m-Interval Partition Test to their bivariate counterparts is considered in detail. In particular, the application of the bivariate tests to edge detection in image processing is presented, showing the power of these tests. These tests are shown to effectively increase the signal-to-noise ratio by as much as a factor of 1.4. A general integral representation of a broad class of nonparametric bivariate statistics is developed. An important factor to be considered is that of estimating the optimum scores for these tests when the underlying distributions function is unknown. The Robbins-Monro stochastic approximation algorithm is used to develop techniques for estimating the optimum scores when the underlying distribution function is unknown. In the mixture type distribution where the system is subject to burst noise intermittently, these estimators may fail to converge, or will converge very slowly as a result of the high variance

noise terms. To overcome this, a robustized RMSA algorithm using a nonlinear pre-processor is introduced. Dissert. Abstr.

N82-10752*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
NASA LARC RAFTOR DOCUMENTATION VERSION 1.0
H. J. Dunn Sep. 1981 21 p ref
(NASA-TM-83173) Avail: NTIS HC A02/MF A01 CSCL 09B

The use of a preprocessor of the LaRC computer center that converts RAFTOR source into FORTRAN source code is described. The purpose of RAFTOR is to make FORTRAN a better programming language for both writing and structuring programs. It is concluded that RAFTOR can generate a well structured program with a source code that is easy to follow.
E.A.K.

N82-10753*# Mississippi State Univ., Mississippi State. Dept. of Electrical Engineering.
A STUDY OF HIGH DENSITY BIT TRANSITION REQUIREMENTS VERSUS THE EFFECTS ON BCH ERROR CORRECTING CODING Interim Final Report, 1 Jul. 1980 - 30 Sep. 1981
Frank Ingels and William O. Schoggen 30 Sep. 1981 99 p refs
(Contract NAS8-33887)
(NASA-CR-161881) Avail: NTIS HC A05/MF A01 CSCL 09B

Several methods for increasing bit transition densities in a data stream are summarized, discussed in detail, and compared against constraints imposed by the 2 MHz data link of the space shuttle high rate multiplexer unit. These methods include use of alternate pulse code modulation waveforms, data stream modification by insertion, alternate bit inversion, differential encoding, error encoding, and use of bit scramblers. The psuedo-random cover sequence generator was chosen for application to the 2 MHz data link of the space shuttle high rate multiplexer unit. This method is fully analyzed and a design implementation proposed. J.M.S.

N82-10754*# Martin Marietta Corp., Bethesda, Md.
USER'S MANUAL: THERMAL RADIATION ANALYSIS SYSTEM TRASYS 2
Carl L. Jensen Jun. 1981 471 p refs Revised
(Contract NAS9-15832)
(NASA-CR-161077; MCR-73-105-Rev-3) Avail: NTIS HC A20/MF A01 CSCL 09B

A digital computer software system with generalized capability to solve the radiation related aspects of thermal analysis problems is presented. When used in conjunction with a generalized thermal analysis program such as the systems improved numerical differencing analyzer program, any thermal problem that can be expressed in terms of a lumped parameter R-C thermal network can be solved. The function of TRASYS is twofold. It provides: (a) Internode radiation interchange data; and (b) Incident and absorbed heat rate data from environmental radiant heat sources. Data of both types is provided in a format directly usable by the thermal analyzer programs. The system allows the user to write his own executive or driver program which organizes and directs the program library routines toward solution of each specific problem in the most expeditious manner. The user also may write his own output routines, thus the system data output can directly interface with any thermal analyzer using the R-C network concept. A.R.H.

N82-10755# University of Central Florida, Orlando. Dept. of Mathematics and Statistics.
A FORTRAN PROGRAM FOR ESTIMATING PARAMETERS IN A CUMULATIVE DISTRIBUTION FUNCTION
Steven J. Bean, Mark Heuser, and Paul N. Somerville Hanscom AFB, Mass. AFGL 31 Mar. 1981 18 p
(Contract F19628-80-C-0004; AF Proj. 6670)
(AD-A104165; SCIENTIFIC-3; AFGL-TR-81-0120) Avail: NTIS HC A02/MF A01 CSCL 12/1

The report documents and gives a listing for a FORTRAN program written to estimate the parameters of a cumulative distribution function which best fits an empirical cumulative distribution function in a least squares sense. Nonlinear regression techniques are used. The program as listed uses the Weibull distribution for the fit, but with the replacement of certain modules the program may be used to fit many different distributions.
Author (GRA)

N82-10756# Bedford Research Associates, Mass.
USER GUIDE FOR INTERACTIVE APPLICATION PROGRAM (IAP)
E. Cronin, D. Dechichio, and P. Meehan 1 Jan. 1981 26 p
(Contract F19628-80-C-0124; AF Proj. 9993)
(AD-A104085; SCIENTIFIC-1; AFGL-TR-80-0370) Avail: NTIS HC A03/MF A01 CSCL 09/2

The Interactive Application Program, which will be referred to by IAP, has been designed to generate a BATCH job (consisting of a control card record and data input record) reporting on the DMSP data base and/or in copying part of the data base. The BATCH job is necessary because the data base is on several tapes which cannot be hung interactively. The respective reporting and copying modules are described herein. Author (GRA)

N82-10757# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.
MARR'S APPROACH TO VISION
Tomaso Poggio Aug. 1981 8 p
(Contract N00014-80-C-0505; Grant NSF MCS-79-23110)
(AD-A104198; AI-M-645) Avail: NTIS HC A02/MF A01 CSCL 09/2

In the last seven years a new computational approach has led to promising advances in the understanding of biological visual perception. The foundations of the approach are largely due to the work of a single man, David Marr at M.I.T. Now, after his death in Boston on November 17th, 1980, research in vision will not be the same for the growing number of those who are following his lead. Author (GRA)

N82-10758# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.
THE IMAGE IRRADIANCE EQUATION: ITS SOLUTION AND APPLICATION
Anna R. Bruss Jun. 1981 110 p refs
(Contracts N00014-80-C-0505; N00014-77-C-0389)
(AD-A104043; AI-TR-623) Avail: NTIS HC A06/MF A01 CSCL 12/1

How much information about the shape of an object can be inferred from its image? In particular, can the shape of an object be reconstructed by measuring the light it reflects from points on its surface? These questions were raised by Horn (H070) who formulated a set of conditions such that the image formation can be described in terms of a first order partial differential equation, the image irradiance equation. In general, an image irradiance equation has infinitely many solutions. Thus constraints necessary to find a unique solution need to be identified. First we study the continuous image irradiance equation. It is demonstrated when and how the knowledge of the position of edges on a surface can be used to reconstruct the surface. Furthermore we show how much about the shape of a surface can be deduced from so called singular points. At these points the surface orientation is uniquely determined by the measured brightness. Then we investigate images in which certain types of silhouettes, which we call b-silhouettes, can be detected. In particular we answer the following question in the affirmative: Is there a set of constraints which assure that if an image irradiance equation has a solution, it is unique? To this end we postulate three constraints upon the image irradiance equation and prove that they are sufficient to uniquely reconstruct the surface from its image. GRA

N82-10759# Los Alamos Scientific Lab., N. Mex. Health Div.
ILLUSTRATOR'S VIEW OF MORE-EFFECTIVE TECHNICAL COMMUNICATION THROUGH COMPUTER GRAPHICS
Kathleen D. DeGasperi 1981 12 p Presented at SIGGRAPH: The 8th Ann. Conf. on Computer Graphics and Interactive Tech., Dallas, 3-7 Aug. 1981
(Contract W-7405-eng-36)
(DE81-769507; LA-UR-80-3457) Avail: NTIS HC A02/MF A01

Computer graphics as an art media tool for the illustrator

often surpasses other available media. After the speed of the computer, its capability to produce an incredible range of complex color schemes makes it such an invaluable aid. However, this medium is frequently not used to its fullest capacity in the field of technical communication. This is because of the lack of well-designed visual presentations. In particular, this situation is often caused by the improper use of color, the lack of contrast, and visual continuity. Improving the state-of-the-art in the area of visual presentations by including graphic design techniques, a common-reference language, and by improving versatility in graphics programs and software packages is discussed. DOE

N82-10760# Los Alamos Scientific Lab., N. Mex.
METAFILE FOR EFFICIENT SEQUENTIAL AND RANDOM DISPLAY OF GRAPHICS
Theodore Niles Reed 1981 12 p refs Presented at SIGGRAPH Conf., Dallas, 3-7 Aug. 1981
(Contract W-7405-eng-36)
(LA-UR-80-3642; CONF-810805-1) Avail: NTIS HC A02/MF A01

Objectives and applications of the common graphics system (CGS) metafile are given. Details of the format and the random access techniques incorporated in the CGS Metafile are described. DOE

N82-10761# Los Alamos Scientific Lab., N. Mex.
SATELLITE GRAPHICS OUTPUT STATION
Richard Wolf 1981 18 p refs Presented at the SIGGRAPH Conf., Dallas, 3-7 Aug. 1981
(Contract W-7405-eng-36)
(DE81-769454; LA-UR-80-3716; CONF-810805-2) Avail: NTIS HC A02/MF A01

A satellite graphics output station is described. This station serves to directly accept user requests for output via a large computer network. The system orders these requests and schedules output on one of several devices consistently with the user's request and the overall job turnaround requirements of the laboratory. The system translate a standard Metafile into a device-specific format and efficiently generates the requested output. At this same time, the print and graphics express station provides some graphics processing. The system provides current information on queues, jobs being processed, and the devices. An effective quality control program is an integral part of the system design. DOE

N82-10762# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Computer Science.
RECONCILING DATA FLOW MACHINES AND CONVENTIONAL LANGUAGES
Arthur H. Veen Sep. 1980 18 p refs Submitted for publication
(MC-IW-146/80) Avail: NTIS HC A02/MF A01; Stitching Mathematisch Centrum, Amsterdam FL 3

A project aimed at developing a compiler for an existing high level language for string processing is considered. The compiler is intended to accept the full language without changing its semantics in any respect. The implementation of a sizeable subset of the language is described, and solutions to the remaining problems are suggested. The results indicate that the gap between data flow machines and conventional languages is easier to bridge than previously assumed. Author (ESA)

N82-10763# Research Inst. of National Defence, Stockholm (Sweden). Huvudavdelning 1.
USES OF THE SIMULA PROCESS CONCEPT
Jacob Palme Feb. 1981 13 p refs
(FOA-C-10172-M6) Avail: NTIS HC A02/MF A01

Examples from existing programs as to how the process aspect of the class concept can be used to structure programs are described. All the examples are taken from real production programs in heavy usage, but they are simplified to illustrate the main idea. Examples considered are: the splitting of a data stream (a sequential file of records); the evaluation of Boolean expressions; the debugging of part of a program while simulating parts not yet written; and a menu structured user interface. Author (ESA)

N82-10764# Royal Inst. of Tech., Stockholm (Sweden). Dept. for Numerical Analysis and Computing Science.
INTEGRAL: A PROPOSAL FOR A RESEARCH LABORATORY OF THE DEPARTMENT FOR NUMERICAL ANALYSIS AND COMPUTING SCIENCE
Oerjan Ekeberg, Jan Olof Eklundh, Kerstin Frencker, Anders Hillbo, Lars Kjelldahl, Anders Lansner, Lennart Pettersson, Bjoern Ringh, Staffan Romberger, Yngve Sundblad et al 1981 49 p refs
(TRITA-NA-8103) Avail: NTIS HC A03/MF A01

The design of a laboratory destined to develop knowledge, methods and tools for computer aided structuring, interpretation, editing and presentation of text and picture information with high quality in readability and intelligibility is discussed. Techniques from computer graphics, text processing, (digitized) image processing, computer vision and pattern analysis, are integrated to establish an openly available basis of knowledge and to support education. Author (ESA)

N82-10765# National Bureau of Standards, Washington, D.C. Center for Programming Science and Technology.
SPECIFICATIONS AND TEST METHODS FOR NUMERIC ACCURACY IN PROGRAMMING LANGUAGE STANDARDS Final Report
John V. Cugini Jun. 1981 42 p refs
(PB81-219305; NBS-SP-500-77; LC-81-600056) Avail: NTIS HC A03/MF A01 CSCL 09B

Language-independent and machine-independent criteria for assessing the quality of floating-point arithmetic operations and functions are formulated. The criteria require that results be within the limits generated by perturbing the arguments or operands by a specified amount, and thus allow for the mathematical instability of some functions at certain arguments and also for the granularity of numeric representation inherent in digital machines. Automatic test methods derive naturally from the accuracy requirements. Model algorithms for testing are included. GRA

N82-10766# National Bureau of Standards, Washington, D.C. Center for Programming Science and Technology.
NBS PROGRAMMING ENVIRONMENT WORKSHOP REPORT Final Report
Martha A. Branstad, ed. and W. Richards Adrion, ed. Jun. 1981 109 p refs Conf. held at Rancho Sante Fe, Calif., 29 Apr. - May 1980
(PB81-223430; NBS-SP-500-78; LC-81-600068) Avail: NTIS HC A06/MF A01 CSCL 09B

The state-of-the-art in programming environment technology and the key questions and issues that must be addressed to use these techniques to improve software quality and productivity within the Federal Government are addressed. GRA

N82-10994# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE AUTOMATIC MATRIX FORCE METHOD AND TECHNIQUES FOR HANDLING MORE COMPLEX COMPUTATIONS WITH GIVEN COMPUTER CAPACITY
Yang Qingxiong *In its* Recent Selected Papers of NW Polytech. Univ., pt. 1 (FTD-ID(RS)T-0259-81-Pt-1) 20 Aug. 1981 p 338-358 refs Transl. into ENGLISH from Recent Selected Papers of NW Polytech. Univ., pt. 1 (Xian Shaanxi), 1979 (For primary document see N82-10980 01-99)
Avail: NTIS HC A17/MF A01

62 COMPUTER SYSTEMS

Includes computer networks.

N82-10767*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
REMOTELY PILOTED VEHICLE: APPLICATION OF THE GRASP ANALYSIS METHOD
William L. Andre and J. Bradley Morris Sep. 1981 60 p Prepared in cooperation with Army Research and Technology Labs., Moffett Field, Calif.
(NASA-TM-81261; A-8456; USAAVRADCOM-TR-81-A-22) Avail: NTIS HC A04/MF A01 CSCL 09B

The application of General Reliability Analysis Simulation Program (GRASP) to the remotely piloted vehicle (RPV) system is discussed. The model simulates the field operation of the RPV system. By using individual component reliabilities, the overall reliability of the RPV system is determined. The results of the simulations are given in operational days. The model represented is only a basis from which more detailed work could progress. The RPV system in this model is based on preliminary specifications and estimated values. The use of GRASP from basic system definition, to model input, and to model verification is demonstrated. S.L.

N82-10768# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.
CHAOSNET
David A. Moon Jun. 1981 63 p refs
(Contract N00014-80-C-0505)
(AD-A104024; AI-M-628) Avail: NTIS HC A04/MF A01 CSCL 09/2

Chaosnet is a local network, that is, a system for communication among a group of computers located within about 1000 meters of each other. Originally developed by the Artificial Intelligence Laboratory as the internal communications medium of the Lisp Machine system, it has since come to be used to link a variety of machines around MIT and elsewhere. This memo describes both the hardware and software protocols. It is intended to be the definitive documentation for Chaosnet.
Author (GRA)

63 CYBERNETICS

Includes feedback and control theory.

For related information see also *54 Man/System Technology and Life Support*.

N82-10769 North Carolina State Univ. at Raleigh.
OPTIMAL CONTROL OF ARRIVALS TO AN ACYCLIC QUEUEING NETWORK OF TWO EXPONENTIAL SERVERS Ph.D. Thesis
Hussein Atta Ghoneim 1980 108 p
Avail: Univ. Microfilms Order No. 8111004

An acyclic queueing network of two exponential servers is discussed. The input to such a network can be controlled by accepting or rejecting arriving customers. It is assumed that customers arrive from a Poisson process. The arrivals are of two types: those that join server (1) then go to server (2) or those that join server (2) directly. Conditions under which a monotonic control policy is optimal are determined. Optimal decision rules for customers seeking self and social optimization are examined and, that the usual result that individual optimization tends to over congest the servie system is not necessarily true for type (1) customers. These results are established for finite and infinite horizons. Dissert. Abstr.

N82-10770 Polytechnic Inst. of New York, Brooklyn.
APPROXIMATION METHODS FOR ANALYSIS OF QUEUES WITH APPLICATION TO PROBLEMS IN COMPUTER COMMUNICATION NETWORKS Ph.D. Thesis
Hsiao-Mei Jean Hu 1981 114 p
Avail: Univ. Microfilms Order No. 8118874

Methodologies as well as numerical examples for all the approximation methods are presented. Two different methods of approximation, the diffusion approximation and the method of stages, are studied. Two distinct ways of approximation are presented: Prony's method and the rational function method. The rational function method approximates the moment generating function of pertinent distributions by rational functions which can then be transformed back generating approximate p.d.f's in the form of weighted sums of hyperexponential or Erlangian distribution. Dissert. Abstr.

N82-10771 Carnegie-Mellon Univ., Pittsburgh, Pa.
PARTITIONED QUEUEING NETWORK MODELING AND PERFORMANCE ANALYSIS OF MULTI-PROCESSORS Ph.D. Thesis
William Robert Paulsen 1981 143 p
Avail: Univ. Microfilms Order No. 8118444

A closed queueing network approximation analysis technique that is shown to be particularlysuited to a certain class of memory access level multiprocessor performance models is presented. This class has the property that subnetworks of queues can be found such that customers associated with a particular subnetwork traverse queues only within that subnetwork, or they traverse any of a set of shared queues. The approximation technique is described by several algorithms, which are symbolically evaluated for simple networks and numerically evaluated for larger networks. Errors introduced by the approximation, with respect to exact evaluation results, are discussed. The approximation technique is thoroughly examined to the extent that one may estimate, or predict, the error that will be incurred in using the approximation method before it is applied to the analysis of a given network. Several examples of multiprocessor analyses are given that indicate the error is often small, yet a computationally feasible solution is provided. Dissert. Abstr.

N82-10772 Massachusetts Univ., Amherst.
STABLE ADAPTIVE CONTROL FOR MULTIVARIABLE SYSTEMS Ph.D. Thesis
Velliyiur Nott Subbarao 1981 112 p
Avail: Univ. Microfilms Order No. 8118048

Stable adaptive controllers are designed for multivariable systems, when only the input and output signals are accessible and not the entire state vector. The desired dynamic behavior is characterized by a reference model. The control inputs are synthesized along with the associated adaptive parameters of the plant so that the plant outputs track the model outputs asymptotically. In these design schemes feedback and feedforward gains are adjusted to compensate for unknown plant parameters. Lyapunov's direct method forms the basis of the algorithm for adaptive laws for the multivariate system. The global asymptotic stability of the adaptive controller can be implemented as a differentiator-free dynamical system. In the case of single-input single-output plants, globally stable controllers are designed using simpler auxiliary inputs. Variable adaptation gain algorithms, which can be used to improve the transient response of the plant, are developed. Furthermore the property of global asymptotic stability of the adaptive algorithm is preserved in the variable adaptation gain schemes. Dissert. Abstr.

N82-10773# Research Inst. of National Defence, Stockholm (Sweden).
INTRODUCTION TO NONLINEAR CONTROL TECHNIQUES [INTRODUKTION TILL OLINJAER REGLERTEKNIK]
Lennart Brandqvist Jul. 1980 60 p In SWEDISH
(FOA-C-20363-E3) Avail: NTIS HC A05/MF A01

Transfer functions for nonlinear chains are classified. Descriptive functions, single sine and double sine are considered. A method to convert nonlinear chains to linear ones is presented. Intentional introduction of nonlinearities in control systems is also covered. Ordinary analytical methods for analysis for nonlinear systems are mentioned. Author (ESA)

N82-10774# European Space Agency, Paris (France).
PERFORMANCE EVALUATION OF UNCONSTRAINED OPTIMIZATION TECHNIQUES
Dieter Kraft and Gerhard Kreisselmeier Apr. 1981 43 p refs
Transl. into ENGLISH of "Vergleich von Verfahren zur unbeschraenkten Optimierung von Funktionen mehrerer Variabler" Rept. DFVLR-Mitt-79-21 DFVLR, Oberpfaffenhofen, West Germany, Sep. 1979 Original report in GERMAN previously announced as N81-14992
(ESA-TT-669; DFVLR-Mitt-79-21) Avail: NTIS HC A03/MF A01; DVFLR, Cologne DM 12.80

Algorithms for unconstrained optimization of functions of several variables are described. Their performance as implemented FORTRAN programs is evaluated by comparing results of test examples. Unconstrained optimization is not only important by itself for unconstrained problems, but also plays a significant role as core algorithm in constrained optimization (penalty and multiplier methods). Methods requiring a gradient calculation (quasi-Newton methods) and methods not requiring a gradient calculation are included. The general method of iteration, Quasi-Newton formulas and step-length algorithms are described. None of the program variants can provide a solution to every

example without modification to the starting values, i.e., the programs cannot be utilized in all cases, without any further consideration, like a black box; they require some degree of experience on the part of the user. Author (ESA)

N82-10988# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
MODEL METHOD OF STATE ESTIMATION
Dai Guanzhong *In its* Recent Selected Papers of NW Polytech. Univ., pt. 1 (FTD-ID(RS)T-0259-81-Pt-1) 20 Aug. 1981 p 156-190 refs Transl. into ENGLISH from Recent Selected Papers of NW Polytech. Univ., pt. 1 (Xian Shaanxi), 1979 (For primary document see N82-10980 01-99)
Avail: NTIS HC A17/MF A01

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N82-10775 Mississippi Univ., University.
ON THE SOLUTIONS OF MIXED BOUNDARY VALUE PROBLEMS VIA VARIATIONAL TECHNIQUES AND INTEGRAL EQUATIONS Ph.D. Thesis
Sam Sohrab Gordji 1981 104 p
Avail: Univ. Microfilms Order No. 8117284

Several methods of solving mixed boundary value problems which arise in engineering applications, particularly in solid mechanics are discussed. The classical method of solving dual integral equations by conversion into singular integral equations is applied to the determination of stresses in a folded plate structure which is weakened by a crack. The least square technique is applied to an example of a mixed boundary value problem in potential theory governed by dual trigonometric series. In order to solve the infinite number of unknown constants, certain integral functions are examined. The minimization of this function leads to a system of linear algebraic equations for the determination of the unknown constants. The method is extended in the context of mixed boundary value problems of linear elasticity in a rectangular domain. The problem is formulated in terms of complex valued eigenfunctions which posses modified and complicated orthogonality properties. This renders the construction of the integral function nonunique. Dissert. Abstr.

N82-10776 Notre Dame Univ., Ind.
DEFINING FUNCTIONS OF BOUNDED GROWTH FOR ANALYTIC SUBSETS OF ALGEBRAIC VARIETIES Ph.D. Thesis
James Emmett Curry 1981 151 p
Avail: Univ. Microfilms Order No. 8118564

Let A be an analytic subset of pure dimension P of an affine algebraic variety V of dimension m > p embedded into a complex projective space W (doublebar) of dimension k. A complex projective space S of dimension (k-m-1) is given embedded into the hyperplane at infinity, W(double bar)-W. An affine subspace Y of dimension m in the affine space W is given so that the projection centered at S of V onto Y is proper, subjective, and holomorphic. It is shown that for small perturbations of S, corresponding central projections remain proper, subjective, and holomorphic. In this way, a family of projections parameterized by a Grassmannian G sub s(W) is obtained. By Remmert's Proper Mapping Theorem, the image of A under a proper holomorphic map is again an analytic set of pure dimension p in Y. Because Y is a vector space, well known results of Skoda allow the construction of defining functions of bounded growth on Y. An induction technique allows the choice of (m + 1) of these functions which pulled back to V by the appropriate projections, form a family of defining functions for A in V. Estimates are included to show that these functions again have appropriately bounded growth properties. Dissert. Abstr.

N82-10777 California Univ., Riverside.
RIDGE REGRESSION: CONSTRAINED OPTIMIZATION WITH APPLICATIONS IN DESIGN OF EXPERIMENTS Ph.D. Thesis
Kent Douglas Smith 1981 145 p
Avail: Univ. Microfilms Order No. 8119579

The constraint required to derive ridge regression estimates is contrasted with those used in classical design of experiments estimation; the required constraint is shown to be related to the ridge parameter. The application of ridge regression estimates to the general linear model was furthered by developing testing procedures based upon a constrained likelihood ratio technique. The resulting distributions were derived and techniques for conducting tests of hypotheses based upon ridge regression estimates were developed. Finally, ridge regression estimation procedures were developed for design of experiment models. Such models are ideally suited for ridge regression techniques since the matrix is almost always singular. Parameter estimates are readily obtained since the design matrix has such a well defined pattern to its structure. Dissert. Abstr.

N82-10778*# Stanford Univ., Calif. Inst. for Plasma Research.
EXAMINATION OF TIME SERIES THROUGH RANDOMLY BROKEN WINDOWS
P. A. Sturrock and E. C. Shoub Jul. 1981 23 p refs
(Grant NGL-05-020-272; Contract N00014-75-C-0673)
(NASA-CR-164901; SU-SUIPR-824R) Avail: NTIS HC A02/MF A01 CSCL 12A

In order to determine the Fourier transform of a quasi-periodic time series (linear problem), or the power spectrum of a stationary random time series (quadratic problem), data should be recorded without interruption over a long time interval. The effect of regular interruption such as the day/night cycle is well known. The effect of irregular interruption of data collection (the 'breaking' of the window function) with the simplifying assumption that there is a uniform probability p that each interval of length tau, of the total interval of length T = N sub tau, yields no data, is investigated. For the linear case it is found that the noise-to-signal ratio will have a (one-sigma) value less than epsilon if N exceeds p(-1)(1-p)epsilon(-2). For the quadratic case, the same requirement is met by the less restrictive requirement that N exceed p(-1)(1-p)epsilon(-1). Author

N82-10779# Oakland Univ., Rochester, Mich. Dept. of Physics.
THE USE OF FOURIER TRANSFORM METHODS FOR THE EVALUATION OF COEFFICIENTS IN A TAYLOR SERIES TO ARBITRARY ORDER
J. M. McKinley and P. P. Schmidt 1 Aug. 1981 26 p refs Submitted for publication
(Contract N00014-77-C-0293; NR Proj. 359-648)
(AD-A103997; TR-6) Avail: NTIS HC A03/MF A01 CSCL 12/1

We present a new formulation of the Taylor series for a class of functions which can be expressed as the product of a purely angular and purely radial part, viz., G(R sub T) = Y sub (lambda mu)(r)f(r) in which Y sub (lambda mu) (R) is the spherical harmonic function. The formulation is based upon the use of the Fourier transform of the function to be expanded. The general expression for the Taylor series which we obtain is similar in form to the Laplace expansion for the Coulomb potential. Thus, Taylor series can be developed for aribtrary functions along lines which are similar to the multipolar expansions in the electromagnetic theory. Such expansions are easily adapted to the symmetry of a collection of sources. Author (GRA)

N82-10780# Maryland Univ., College Park. Inst. for Physical Science and Technology.
A-POSTERIORI ERROR ESTIMATES AND ADAPTIVE TECHNIQUES FOR THE FINITE ELEMENT METHOD
I. Babuska and A. Miller Jun. 1981 108 p refs
(Contract N00014-77-C-0623)
(AD-A104003; BN-968) Avail: NTIS HC A06/MF A01 CSCL 12/1

The theory of the computable a-posteriori error estimate for a finite element method is developed. Among other things, it is shown that the error estimate is very reliable and the ratio (called effectivity index) between the estimator and the true error approaches one. Numerical examples computed by program FEARS (Finite Element Adaptive Research Solver) of the University of Maryland, illustrate the effectivity and reliability of the estimators. Author (GRA)

N82-10781# Oak Ridge Y-12 Plant, Tenn. Fabrications Systems Dept.
INTERPOLATION ALGORITHMS FOR MACHINE TOOLS
R. R. Burleson Aug. 1981 20 p refs
(Contract W-7405-eng-26)
(DE81-029463; Y-2223) Avail: NTIS HC A02/MF A01

Three types of interpolation algorithms used in most numerical control systems (digital differential analyzer, pulse-rate multiplier, and binary-rate multiplier) are described. A method for higher order interpolation is also discussed. The trends point toward the use of high-speed microprocessors to perform these interpolation algorithms. DOE

N82-10782# Argonne National Lab., Ill. Applied Mathematics Div.
IMPROVING THE ACCURACY OF COMPUTED EIGENVALUES AND EIGENVECTORS
J. J. Dongarra, C. D. Moler (New Mexico Univ.), and J. H. Wilkinson (Stanford Univ.) Jul. 1981 31 p refs
(Contract W-31-109-eng-38; Grants NSF MCS-76-03297; AF-AFOSR-0094-79)
(DE81-028480; ANL-81-43) Avail: NTIS HC A03/MF A01

A computational method for improving the accuracy of a given eigenvalue and its associated eigenvectors is described. The method is analogous to iterative improvement for the solution of linear systems. An iterative algorithm using working precision arithmetic is applied to increase the accuracy of the eigenpair. The only extended precision computation is the residual calculation. The method is related to inverse iteration and to Newton's method applied to the eigenvalue problem. DOE

N82-10783# Research Inst. of National Defence, Stockholm (Sweden). Huvudavdelning 2.
INTRODUCTION OF EVENT TREE ANALYSIS INTO THE EFFICIENCY CALCULATIONS FOR AIRBORNE TARGETS [INFOERAANDE AV HAENDELSETRAEDSANALYS I VERKANSBERAEKNINGAR FOER LUFTMAAL]
Per-Olof Fjellstroem, Lars Eriksson, and Peter Verstaendig Oct. 1980 35 p refs In SWEDISH
(FOA-C-20374-D8) Avail: NTIS HC A03/MF A01

An algorithm which can be applied to relatively complex event trees is treated. Its use in the calculation of the effects of fighting components in airborne targets is described. A special operator, called KOMPTAB, is used to estimate the consequences of the damage caused by firing and to evaluate the possibilities that the target can survive and fulfill its assignment. Author (ESA)

N82-10784# Oxford Univ. (England). Engineering Lab.
MULTIVARIABLE SECTORS AND NONLINEAR STABILITY. PART 2: A GENERALIZATION OF THE CIRCLE CRITERION
B. Kouvaritakis and R. Husband 1981 30 p refs 2 Vol.
(OUEL-1355/81-Pt-2) Avail: NTIS HC A03/MF A01

The use of appropriate sector conditions in conjuction with the decomposition of a linear operator into two linear operators, phi and G-phi, where phi has a normal transfer function matrix, leads to a useful stability criterion for a class of multivariable nonlinear feedback systems. This sector approach is adopted and the decomposition of the linear operator is used order to define frequency dependent sectors, which leads to a natural extension of the circle criterion to the multivariable case. The result has a simple graphical interpretation and lends itself to a computer implementation which can be shown to be numerically stable. Author (ESA)

N82-10785# Oxford Univ. (England). Engineering Lab.
MULTIVARIABLE SECTORS AND NONLINEAR STABILITY. PART 1: THE USE OF SECTORS IN THE DERIVATION OF STABILITY CRITERIA FOR NONLINEAR MULTIVARIABLE SYSTEMS
R. Husband and B. Kouvaritakis 1981 25 p refs 2 Vol.
(OUEL-1359/81-Pt-1) Avail: NTIS HC A02/MF A01

The definition and properties of the sector of scalar systems are extended to systems with many-inputs and many-outputs. On the basis of these definitions it is possible to state a simple stability criterion for a class of nonlinear multivariable systems. A suitable decomposition of the linear element G of the nonlinear feedback system, enables the derivation of a generalization of the circle criterion. This involves the frequency response of the eigenvalues of a normal matrix and an expanded version of the classical on-axis circle. The expansion of the circle is due to the deviation of the transfer function matrix of G from normality which is measured by appropriate sector conditions o the error operator G-phi. Author (ESA)

N82-10786 Carnegie-Mellon Univ., Pittsburgh, Pa.
ON NUMERICAL SOLUTIONS TO INTEGRAL EQUATIONS Ph.D. Thesis
Harold Edward Donley, Jr. 1981 85 p
Avail: Univ. Microfilms Order No. 8118431

Numerical solutions to three problems formulated in terms of Fredholm integral equations are discussed. The first problem is in an abstract setting. A first kind operator equation is solved on Hilbert spaces using the method of regularization and least squares approximations. In a Sobolev space setting with finite element subspaces it is shown that for an apropriate choice of the regularization parameter, optimal error bounds are attained. The second integral equation is a first kind weakly singular Fredholm equation arising from potential theory via Fichera's method. Existence and stability results are obtained for piece-wise constant collocation approximations for the integral equations associated with Laplace's equation on a circle. Experimental error estimates are also included. Finally, some results of numerical experiments for some two- and three-dimensional linear elastic fracture mechanics problems are discussed. Dissert. Abstr.

N82-11005# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ON THE UNIQUENESS OF THE SOLUTION TO THE VELOCITY POTENTIAL INTEGRAL EQUATION ESTABLISHED BY USING GREEN'S THEOREM
Liu Qiangang *In its* Recent Selected Papers of NW Polytech. Univ., pt. 2 (FTD-ID(RS)T-0260-81-Pt-2) 28 Aug. 1981 p 273-286 refs Transl. into ENGLISH from Recent Selected Papers of NW Polytech. Univ., pt. 2 (Xian Shaanxi), 1979 (For primary document see N82-10996 01-99)
Avail: NTIS HC A18/MF A01

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N82-10787 Case Western Reserve Univ., Cleveland, Ohio.
A COMPARISON OF FISHER'S LINEAR DISCRIMINANT AND THE LOGISTIC CONDITIONAL MAXIMUM LIKELIHOOD CLASSIFICATION TECHNIQUES Ph.D. Thesis
Linda Jane Dohanich Goldsmith 1981 144 p
Avail: Univ. Microfilms Order No. 8118621

Fisher's linear discriminant and the logistic conditional maximum likelihood method, two currently applied linear classification methods are compared in the two-group case for small- to moderate-sized samples. The comparisons are based on results of a Monte Carlo simulation computer program which summarizes estimates of the expected error rates, relative efficiencies, expected linear classifier coefficients, and other performance measurements. Distribution types (and sample sizes) for the population pairs considered include: (1) multivariate normal with identical unknown variance-covariance matrices (N = 20, 50, 100); (2) multivariate binary (N = 100, 200); and (3) independent mixes of 1 and 2 (N = 100, 200). Both methods performed well in terms of expected error rates and other measurements on all the population pairs in which the optimal method (the method of choice when the population parameters are known) is a linear classifier. When the optimal method is not a linear classifier, both methods perform poorly. Data from some multinomial distributions originally coded as multivariate binary can be recoded to yield linear models on which the two methods perform well. Dissert. Abstr.

N82-10788 Princeton Univ., N. J.
MODELING DATA AS A FRACTIONAL GAUSSIAN NOISE Ph.D. Thesis

Donna Leah Mohr 1981 156 p
Avail: Univ. Microfilms Order No. 8119125

Time series in which distant records are strongly correlated are addressed. Specifically, a family of processes called fractional gaussian noise are discussed which have a covariance function which asymptotically is proportional to < or = < 1. A method for estimating the mean when H is known is given. This should provide guidance for a method when H is unknown. Confidence intervals for H using R/S Analysis and using a function of the periodogram are presented. The periodgram yields more dependable estimates. Approximate confidence intervals for the mean of the marginal distribution are given using the sample mean and standard deviation. The calculation of these intervals uses an estimates of the unknown nuisance parameter H. The effect of this substitution depends on the length of the series.
Dissert. Abstr.

N82-10789 Pennsylvania Univ., Philadelphia.
STABILITY OF WEIGHTS AND COEFFICIENTS PRODUCED BY CANONICAL CORRELATION AND REDUNDANCY ANALYSIS: A SAMPLING STUDY OF A REAL DATA BASE Ph.D. Thesis
John Algimantas Meskauskas 1981 143 p
Avail: Univ. Microfilms Order No. 8117814

A simulation technique, comparing results found in multiple samples to those for an entire population, was employed. Thirty samples were drawn at each of four different sizes (30, 60, 120, 360) from a population of 7782. Variables were grouped into three covariance structures with six variables each in the X and Y subsets. Structure 1 contained variables with population intercorrelations of 0.29 to 0.61, Structure 2 of 0.13 to 0.35; structure 3 contained a combination of Structure 1 and 2 variables. Canonical correlations and redundancy analyses were run on each of the 120 samples, for each of the three structures, thus resulting in 720 runs. Bias was assessed by comparing the mean result for a set of samples to the corresponding population parameter. Standard error was defined as the standard deviation of sample estimates. Both sample and covariance structure affect the bias of the canonical correlations.
Dissert. Abstr.

N82-10790 Virginia Polytechnic Inst. and State Univ., Blacksburg.
THE ANALYSIS OF VARIANCE WITH UNBALANCED AND INCOMPLETE DATA Ph.D. Thesis
Leigh Whitton Murray 1980 173 p
Avail: Univ. Microfilms Order No. 8116798

The algorithms used by several statistical computer packages to obtain analyses of unbalanced data are discussed. Methods of determining algebraic expressions for the hypotheses tested in such analyses are developed, and some examples of hypotheses tested by various statistical packages are given. Consideration is also given to the extension of these methods of analysis to situations of missing cells and to methods of determining the hypotheses tested in such cases. Finally, a definition of connectedness applied to the cell means model is developed in conjunction with a criteria for determining whether a model is connected.
Dissert. Abstr.

N82-10791 Carnegie-Mellon Univ., Pittsburgh, Pa.
STOCHASTIC MODELS FOR THE DISCOVERY OF OBJECTS IN DISCRETE TIME Ph.D. Thesis
Mark Alan Ciancutti 1981 51 p
Avail: Univ. Microfilms Order No. 8118428

Some stochastic models for the discovery of objects in discrete time periods are presented. Objects are distributed among cells in a variety of ways and at discrete time periods inspections of the cells are conducted to discover the objects. Provisions were made for the movement of undiscovered objects among the cells between inspection periods. Patterns of search for the models which are optimal for various criteria are presented.
Dissert. Abstr.

N82-10792 Texas A&M Univ., College Station.
METHODS FOR ANALYZING UNTRANSFORMED DATA FROM THE NEGATIVE MULTINOMIAL DISTRIBUTION Ph.D. Thesis
Robert Joseph Case, Jr. 1981 94 p
Avail: Univ. Microfilms Order No. 8118246

Several methods for analyzing untransformed data from negative multinomial distributions are presented with examples. These include a test of fit, a comparison of mean values, and an analysis of linear models. The techniques are generalizations of existing univariate methods used to analyze data from generalized Poisson distributions such as the negative bionomial. Constrained minimum chi square estimators are derived separately for the marker parameter and the proportions for each variate in the negative multinomial distribution. The statistics required for performing these tests are based on sample factorial cumulants and sample zero frequencies for each variate in each distribution under consideration. The goodness of fit test is free of disadvantages associated with the Pearson chi square test and is more easily computed through weighted least squares. The advantages of analyzing mean values and linear models on untransformed data are discussed along with a history of the negative multinomial distribution.
Dissert. Abstr.

N82-10793 Loyola Univ., Chicago, Ill.
ROBUSTNESS OF THREE METHODS FOR ASSESSING SECOND ORDER INTERACTION IN MULTIDIMENSIONAL CONTINGENCY TABLES WITH SMALL SAMPLES BY A MONTE CARLO TECHNIQUE Ph.D. Thesis
Joseph William Fidler 1981 318 p
Avail: Univ. Microfilms Order No. 8119974

A Monte Carlo technique generated 3 x 3 x 3, 2 x 2 x 3 and 2 x 2 x 2 contingency tables for the following sample sizes: 20, 40, 60, 80, 100. In addition, four multinomial distributions for each dimension were used as underlying sampling distributions. Each sampling distribution was used to generate 1,825 contingency tables for each sample size. Consequently 109,500 contingency tables were generated for the 60 combinations of dimension (3), sample size (5), and sampling distribution (4). Each table was tested for second order interaction by means of four methods: Bartlett, Iterative Proportional Fitting (IPF), Goodman 1, and Goodman 2. For Goodman 1, a 1/2 was added to each empty cell and for Goodman 2, a 1/2 was added to every cell before the table was tested for second order interaction by the Goodman method.
Dissert. Abstr.

N82-10794 Texas Univ. at Arlington.
THE H-FUNCTION AND PROBABILITY DENSITY FUNCTIONS OF CERTAIN ALGEBRAIC COMBINATIONS OF INDEPENDENT RANDOM VARIABLES WITH H-FUNCTION PROBABILITY DISTRIBUTIONS Ph.D. Thesis
Ivy Dewey Cook, Jr. 1981 239 p
Avail: Univ. Microfilms Order No. 8119277

The exact probability density function and cumulative distribution function of a sum of any number of terms involving any combination of products, quotients, and powers of independent random variables with H-function distributions was determined. Background material, including history on H-functions and the algebra of random variables, definitions and properties of integral transforms, theorems on transformations of random variables, and definition, properties and special cases of the H-function are provided. Evaluation guidelines are established and applied to the known special cases, the Laplace transform, and the derivatives of the H-function. An improved formulation for evaluation of an H-function by summing residues is derived. This formulation is combined with a Laplace transform numerical inversion method to give a second new formulations. The definition, special cases, and transformation theorems for the H-function distribution are presented.
Dissert. Abstr.

N82-10795 Virginia Polytechnic Inst. and State Univ., Blacksburg.
COMPARISON OF REGRESSION MODELS BY THE USE OF STANDARDIZED TOTAL MEAN SQUARED ERROR Ph.D. Thesis
Yuk-Miu Lam 1981 237 p
Avail: Univ. Microfilms Order No. 8118701

The distributions of linear combinations and quadratic forms of indepndent t-variates and their approximations are discussed. The objective of using the C sub p statistic is to find a model which gives the smallest standardized total mean squared error (STMSE) among other candidate regression models. Models with smaller C sub p and C sup close to p are considered. Comparisons of regressions models by the use of their STMSE are performed via hypothesis testing. The test is extended to the simultaneous

comparison of a p-term model with all its possible submodels. Multiple comparisons of all possible models are studied. Stein's two stage sampling procedure is applied to linear regression. The regression model is transformed into a reduced model with errors being Student-t distributed and completely independent of the unknown variance. The development of statistical analysis and model comparisons follows the same path as that for the homogeneous model. Dissert. Abstr.

N82-10796 Claremont Graduate School, Calif.
ERROR REDUCTION TECHNIQUES FOR MONTE CARLO NEUTRON TRANSPORT CALCULATIONS Ph.D. Thesis
Jean Ho-Ming Wang Ju 1981 152 p
Avail: Univ. Microfilms Order No. 8119942

An importance sampling theory for general weighted analog (GWAN) estimators is developed. The optimal choice of the weighting measure v sub 2 (= analog measure), which is identical to that used for unbiased importance sampling, is shown to give rise to a zero-error estimator. A theory for combining possibly biased estimators is developed. A path length importance measure is derived in terms of the terminal importance measure, a general theoem is developed to obtain an importance measure for an estimator satisfying certain conditions of integrability and absolute continuity. With this importance measure, zero-error estimation may be achieved. The error reduction techniques developed in this work are applied to model problems. Modified path length estimation based on the path length importance measure leads to excellent error reduction in all model problems examined. Dissert. Abstr.

N82-10797 Claremont Graduate School, Calif.
CONTRIBUTIONS TO THE THEORY OF ERROR REDUCTION OF QUASI-MONTE CARLO METHODS Ph.D. Thesis
Earl Howard Maize 1981 162 p
Avail: Univ. Microfilms Order No. 8119943

Deterministic error bounds for a variance reducing technique known as weighted importance sampling are developed. The estimates are of a form where g and h are appropriately chosen adjunct functions. In the case g = h = 1, these error bounds reduce to the Koksma-Hlawka Inequality. If added restrictions are placed on the integrand, in particular periodicity and a certain amount of regularity, convergence rates better than O((log N)(s)/N) may be obtained. The only known infinite sequences of sample points which yield this improved convergences rate depend upon taking the fractional parts of irrational numbers, which, because of the necessary truncation in computer implementatin, may lead to unexpected results. A class of infinite dyadic sequences which are easily and exactly implemented on a computer are introduced. These sequences are intimately related to the theory of good lattice points and also result in an improved convergence rate. The use of weighted importance sampling to transform a sufficiently regular integrand into a periodic integrand in order to take advantage of this improved convergence rate is demonstrated. Dissert. Abstr.

N82-10798# Rome Air Development Center, Griffiss AFB, N.Y.
AN ERROR ANALYSIS TECHNIQUE FOR STATISTICAL HYPOTHESIS TESTING. GENERATION OF JOINTLY DISTRIBUTED RANDOM VARIATES
John F. Lennon and Robert J. Papa Mar. 1981 39 p refs (AF Proj. 2305)
(AD-A103956; RADC-TR-81-81) Avail: NTIS HC A03/MF A01 CSCL 12/1

As a part of the study of electromagnetic scattering from rough terrain, various geographical sites were characterized by applying statistical analysis techniques to digitized terrain data bases. One aspect was the use of decision theory formulation to assign an appropriate distribution function to the surface height variations in the regions. This report discusses the decision processes used and the errors to be expected. There are two main themes: assessment of statistical hypothesis testing and application of a numerical technique to determine the errors inherent in the decisions. There are a number of assumptions and constraints that affect the form of the hypothesis test developed for the terrain study and these will be considered. The numerical technique consists in generating jointly distributed random variates in a Monte Carlo type computer procedure. Its application to the specification of decision errors will be described. The formulation allows extension of standard analytic error analysis techniques to cases where the analysis would be intractable. Results are presented and the agreement with analysis for various cases is shown. Author (GRA)

N82-10799# Tennessee Univ., Knoxville. Dept. of Psychology.
AN ALTERNATIVE ESTIMATOR FOR THE MAXIMUM LIKELIHOOD ESTIMATOR FOR THE TWO EXTREME RESPONSE PATTERNS
Fumiko Samejima 29 Jun. 1981 113 p refs
(Contract N00014-77-C-0360; RR0420401)
(AD-A104088; RR-81-1) Avail: NTIS HC A06/MF A01 CSCL 12/1

In the methods and approaches we have developed for estimating the operating characteristics of the discrete item responses, the maximum likelihood estimate of the examinee based upon the 'Old Test' has an important role. When Old Test does not provide us with a sufficient amount of test information for the upper and lower part of the ability interval, however, it is likely that we obtain response patterns which are either all lowest item scores or all highest item scores, and the resultant maximum likelihood estimates are negative or positive infinity. Although such a test is undesirable for us to use as the Old Test, to a certain extent we can salvage the situation by providing some alternative estimator for these two extreme response patterns. Following RR-80-3, 'Is Bayesian Estimation Proper for Estimating the Individual's Ability', in the present paper, such an estimator is proposed and discussed. Author (GRA)

N82-10800# Texas Univ., Austin. Inst. for Fusion Studies.
TURBULENT RESPONSE IN A STOCHASTIC REGIME
K. Molvig (MIT, Cambridge), J. P. Freidburg (MIT, Cambridge), R. Potok (MIT, Cambridge), S. P. Hirshman (Oak Ridge National Lab.), J. C. Whitson (Oak Ridge National Lab.), and T. Tajima Jun. 1981 28 p refs
(Contract DE-FG05-80ET-53088)
(DE81-029768; DOE/ET-53088/30; IFSR-30) Avail: NTIS HC A03/MF A01

The theory for the non-linear, turbulent response in a system with intrinsic stochasticity is considered. It is argued that perturbative Eulerian theories, such as the direct interaction approximation (DIA), are inherently unsuited to describe such system. The exponentiation property that characterizes stochasticity appears in the Lagrangian picture and cannot even be defined in the Eulerian representation. An approximation for stochastic systems - the normal stochastic approximation - is developed and states that the perturbed orbit functions (Lagrangian fluctuations) behave as normally distributed random variables. This is independent of the Eulerian statistics and, in fact, the Eulerian fluctuations are treated as fixed. A simple model problem (appropriate for the electron response in the drrift wave) is subjected to a series of computer experiments. To within numerical noise the results are in agreement with the normal stochastic numerical noise the results are in agreement with the normal stochastic approximation. The predictions of the DIA for this mode show substantial qualitative and quantitative departures from the observations. DOE

N82-10801 Massachusetts Univ., Boston.
CONSTRUCTING THE TENSOR PRODUCT OF GENERALIZED SAMPLE SPACES Ph.D. Thesis
Robin Howard Lock 1981 164 p
Avail: Univ. Microfilms Order No. 8118016

Techniques for constructing the tensor product of a pair of generalized sample spaces as defined in the empirical logic formalism of Randall and Foulis are investigated. One reason for studying this problem is to sufficiently explain the structure underlying these products in order to apply the stochastic theory and inference procedures of operational statistics to the combination of systems or observers. The deterministic probability models on the generalized sample spaces are used to create a duality theory on which most of the constructions are based. Row and column shifts are introduced as a means to generate tensor operations in a procedure to verify these constructions. A reasonable candidate is obtained for the tensor product of generalized sample space which admit a unital set of dispersion free weights by using the duality alone or by combining it with

the theory of interpretation manuals. How these concepts can be applied in explicitly finding the tensor product of any dacification manual is shown. It is proved that the logic of the tensor produce of locally finite manuals depends only on the logic of the factors and define a tensor product of general operational logics.
Dissert. Abstr.

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N82-10802# Engins Matra, Velizy (France).
ANALYSIS OF TECHNIQUES FOR THE REDUCTION OF MODELS. NONLINEAR FILTERING [ANALYSE DES TECHNIQUES DE REDUCTION DE MODELES: FILTRAGE NON-LINEAIRE]
Christian Guedon and Bernard Govin 1980 96 p refs In FRENCH
Avail: NTIS HC A05/MF A01

Diverse techniques which can be applied to particular systems, the equations of which were well adapted to the description of large satellite structures, are critically reviewed. These include aggregation, participation in optimal control, the modal gains technique, impulsion responses, and tests for observability and commandability. The effect of spillover on calculations is also considered. The technique that seems the most promising is the one which depends on modal contributions to impulsion responses, because it comprehends a physical interpretation of truncation phenomena and it is well adapted to an algorithmic treatment.
Author (ESA)

N82-10803# Engins Matra, Velizy (France).
TECHNIQUES FOR THE ANALYSIS OF MULTIVARIABLE LINEAR SYSTEMS BY STATE REQUIREMENTS [TECHNIQUE D'ANALYSE DE SYSTEMES LINEAIRES MULTIVARIABLES PAR LA REPRESENTATION D'ETAT]
Magli Serre, Laurent Bourgeade, and P. E. Bourg 1980 191 p refs In FRENCH
Avail: NTIS HC A09/MF A01

As an alternative to the direct representation of physical systems, i.e., input-output modeled by a function or transfer matrix, an internal representation, which parameterizes the relation between input and output (perhaps multidimensional) by particular intermediary variables that assure the uniqueness of the response and the decoupling of past and future, is proposed. Computer programs, programming, and theoretical verifications are presented as an aid to this analysis. Obtainment of the state representation from a linear differential system with constant coefficients is considered. Extraction of observable and commandable parts of the system is treated.
Author (ESA)

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N82-10804 Notre Dame Univ., Ind.
THE CURVATURE PROPERTIES OF LEFT INVARIANT METRICS ON LIE GROUPS Ph.D. Thesis
Frank Barnet 1981 56 p
Avail: Univ. Microfilms Order No. 8118553

Let G be a Lie group with Lie algebra g. It is shown that x is in the center of g if every tangential plane containing x has nonnegative sectional curvature for all left invariant Riemannian metrics on g. If g is a Lie group containing no compact nonabelian subgroups, it is shown that the scalar curvature of g is nonpositive for all left variant Riemannian metrics on g. It is proved that, if g is any nonabelian Lie group, g admits a left invariant Lorentz metric of positive scalar curvature; and if dim g does not equal 3, g admits a left invariant Lorentz metric of negative scalar curvature. It is then shown exactly which 3 dimensional Lie groups admit left invariant Lorentz metrics of negative scalar curvature.
Dissert. Abstr.

N82-10805 Polytechnic Inst. of New York, Brooklyn.
BRANCHED AFFINE (OR PROJECTIVE) STRUCTURES ON RIEMANN STRUCTURES Ph.D. Thesis
John Thomas Masterson 1981 173 p
Avail: Univ. Microfilms Order No. 8118885

Projective structures on an arbitrary compact Riemann surface of genius g = 1 are considered using the theory of elliptic functions. A correspondence is established between certain possible projective structures on such a surface and a class of linear ordinary differential equations whose coefficients are elliptic functions prescribed by the structure. Utilizing a knowledge of the possible branch, locus divisors of affine structures, a partial answer to the question of when the structure is projective but is not affine is given. Branched affine structures on a compact Riemann surface of genus g > or = 1 are investigated. Using the theory of divisors on a Riemann surface, the existence of branched affine structures with branch locus divisors of degree satisfying a new higher bound is shown. Finally, the question of uniqueness of affine structures is examined and a uniqueness result for such structures is obtained.
Dissert. Abstr.

N82-10806# Oakland Univ., Rochester, Mich. Dept. of Physics.
TAYLOR-LAPLACE EXPANSIONS OF THE YUKAWA AND RELATED POTENTIAL ENERGY FUNCTIONS
J. M. McKinley and P. P. Schmidt 1 Aug. 1981 28 p refs Submitted for publication
(Contract N00014-77-C-0293; NR Proj. 359-648)
(AD-A103998; TR-7) Avail: NTIS HC A03/MF A01 CSCL 12/1

In this paper we apply that form of the Taylor series to the Yukawa potential, and to several potential functions which can be derived from it. In particular, we examine the expansion of the Yukawa potential itself. In the limit as the exponent a vanishes, the Yukawa potential transforms into the Coulomb potential. We show that the limiting process applied to the Taylor series for the Yukawa potential yields the familiar form of the Laplace expansion of the Coulomb potential. Differentiation of the Yukawa potential with respect to the exponent a yields the exponential function. Hence, we develop a Taylor-Laplace power series representation of the Morse potential.
GRA

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N82-10807 Florida Inst. of Tech., Melbourne.
TIME-RESOLVED SPECTRAL EMISSION STUDIES OF A PULSED, HIGH-PRESSURE XENON GAS DISCHARGE Ph.D. Thesis
Manuel Figueroa 1981 461 p
Avail: Univ. Microfilms Order No. 8115521

The physical processes taking place during a high-current discharge in a high-pressure xenon plasma were investigated, with the goal of enhancing the spectral match so as to improve the overall efficiency of solid-state lasers. The dominant mechanism for the production of optical emission from the high-current, high-pressure radiating xenon plasma is that of bound-bound transitions whose characteristic emission lines are broadened to the extent of at least ten angstroms by pressure (collision) broadening and Stark broadening processes. A limited degree of control over the shape of the broad emission spectrum can be exterted by a careful time-tailing of the discharge current pulse, and by proper choice of the flashtube voltage. However, an improved understanding of the time evolution of the plasma electron and ion temperatures and concentrations during the current pulse is necessary in order to more effectively control the optical emission spectrum of the flashtube through adjustment of the available electrical input parameters.
Dissert. Abstr.

N82-10808# Maryland Univ., College Park. Dept. of Chemistry.
DIELECTRIC CONSTANT OF UNDERCOOLED WATER
B. K. Das, G. F. Kraus, J. T. Siewick, and S. C. Greer Sep. 1981 22 p refs Submitted for publication

(Contract N00014-79-C-0008; NR Proj. 051-701)
(AD-A104086; TR-2) Avail: NTIS HC A02/MF A01 CSCL 07/4

Recent work has shown that liquid water has anomalous thermodynamic properties in its metastable undercooled state, below 0 C. We have investigated the static dielectric constant and conductivity of undercooled water by measuring the capacitance (within 0.05%) and conductance (within 0.2%) of water-filled glass capillary capacitance cells between +20 C and -17 C. We find that the capacitance and conductance data over the entire temperature range can be represented by analytic functions. Our measurements show no evidence of anomalous behavior in the dielectric constant or conductivity of undercooled water. Author (GRA)

71 ACOUSTICS

Includes sound generation, transmission and attenuation.

For noise pollution see *45 Environment Pollution*.

N82-10809 Polish Academy of Sciences, Warsaw. Inst. Podstawowxch Problemow Techniki.
PHYSICAL FOUNDATIONS OF ULTRASONICS RESEARCH TRENDS AND ITS APPLICATION IN POLAND
Ignacy Malecki and Jerzy Ranachowski 1981 31 p refs
(ISSN-0208-5658) Copyright. Avail: Issuing Activity

Research trends in the acoustics of solids, of liquids and polymers, in quantum acoustics, ultrasonic nondestructive testing, bioacoustics, and optoacoustics are described. Underwater acoustics efforts are not considered. J.D.H.

N82-10810 Catholic Univ. of America, Washington, D.C.
RESPONSE OF MULTIPLE COUPLED DYNAMIC SYSTEMS Ph.D. Thesis
Lawrence J. Maga 1981 155 p
Avail: Univ. Microfilms Order No. 8118985

The impulse response function of multiple generally coupled, one dimensional, wave bearing dynamic systems in terms of the reflection and transmission coefficients at the boundaries of each system was determined. The description handles a complex dynamic system. The systems reduce properly to fit specific models of simplified complexes. The impulse response function derived is employed to generate an energy analysis (EA) of multiple generally coupled dynamic systems. The approximations and assumptions are examined and assessed. The energy analysis is derived from the impulse response function. The elements of the statistical energy analysis (SEA) are discussed.
Dissert. Abstr.

N82-10811 Indiana Univ., Indianapolis.
INVERSION OF THE FIRST-ORDER EQUATIONS GOVERNING THE PROPAGATION OF SOUND WAVES IN A LAYERED ACOUSTIC MEDIUM Ph.D. Thesis
Michael Steven Howard 1981 103 p
Avail: Univ. Microfilms Order No. 8110028

The inverse scattering problem for a layered acoustic medium is considered from the first order differential equations of motion, resulting in a vector formulation and using a vector form of the inverse scattering methods for Schroedinger's equation of Quantum Mechanics, which is a vector Marchenko equation. The lowest order approximation which accounts for multiple reflections is obtained and compared using synthetic data. The exact inversion method is like the final step in removing the twice differentiable constraint imposed on the impedance profile by the wave equation method. The effects of missing high frequencies, missing low frequencies and noise in the data are compared. The left and right going component vector of the one dimensional case is generalized to two dimensions to allow the velocity and density profiles to be resolved separately as functions of depth from nonnormal incidence data. This involves a nonlinear equation to relate the apparent travel times to depth. Dissert. Abstr.

N82-10812# Hope Associates, Inc., Washington, D.C.
A COMPREHENSIVE BIBLIOGRAPHY OF LITERATURE ON HELICOPTER NOISE TECHNOLOGY Final Report
A. M. Carter, Jr. Jun. 1981 116 p
(Contract DTFA01-80-Y-10597)
(AD-A103331; FAA-EE-81-4) Avail: NTIS HC A06/MF A01 CSCL 20/1

This bibliography, covering the period 1975 through calendar 1980 also provides abstracts on literature that appear to make a significant contribution to the field of helicopter noise technology. The helicopter is recognized as a complex noise generator, with significant contributions from the rotors, the engine and the gearbox. Progress continues to be made in the noise areas of: (a) Formulations, math models and analytical procedures; (b) Noise prediction methodology; (c) Noise reduction techniques; and (d) Subjective response to helicopter noise. The body of information, data and knowledge has use in many applications, including the reduction of helicopter noise in a cost effective manner and in minimizing annoyance to the civil populace. GRA

N82-10813# Utah Univ., Salt Lake City. Dept. of Mathematics.
TRANSIENT ACOUSTIC WAVE PROPAGATION IN STRATIFIED FLUIDS Technical Summary Report
Calvin H. Wilcox Jul. 1981 49 p refs
(Contract N00014-76-C-0276; NR Proj. 041-370)
(AD-A104187; TSR-42) Avail: NTIS HC A03/MF A01 CSCL 20/1

Transient acoustic wave propagation is analyzed for the case of plane-stratified fluids having density rho(y) and sound speed c(y) at depth y. For infinite fluids it is assumed that the (in general discontinuous) functions rho(y), c(y) are uniformly positive and bounded and satisfy abs.val (rho(y) rho(at infinity)) < or = C(+ or - y) to the - alpha power, abs. val. (c(y) - c(at infinity)) < or = C(+ or - y) to the - alpha power for + or - y > 0, where alpha > 3/2. Semi-infinite and finite layers are also treated. The acoustic potential is a solution of the wave equation del-squared u/del t-squared c-squared(y) rho(y) del dot (1/rho(y) grad(u)) = f(t,x,y) where x = (x1,x2) are horizontal coordinates and f(t,x,y) characterizes the wave sources. The principal results of the analysis show that u is the sum of a free component, which behaves like a diverging spherical wave for large t, and a guided component which is approximately localized in regions abs. val. (y - y sub j) < h sub j where c(y) has minima and propagates outward in horizontal planes like a diverging cylindrical wave. Author (GRA)

N82-10814# Research Inst. of National Defence, Linkoeping (Sweden). Huvudavdelning 3.
VIRTUAL HYDROPHONE FOR DETECTING NARROWBAND NOISE FROM A SHIP [VIRTUELL HYDROFON FOER DETEKTERING AV SMALBANDIGT BULLER FRAAN FARTYG]
Lars Goetherstroem Jun. 1980 12 p In SWEDISH
(FOA-C-30193-E1) Avail: NTIS HC A02/MF A01

Virtual hydrophone measurements were carried out. Measuring was done recording moving targets as incoming signals at periodically repeated intervals. These points in the route are given by the virtual hydrophone. Phase stability in the outgoing, narrowband noise signal is required. The signal to noise ratio must be high for each measurement point in order to allow signal addition. The conditions for detection are discussed, showing that the use of this method is particularly limited. Author (ESA)

N82-10815# Research Inst. of National Defence, Umea (Sweden). Huvudavdelning 4.
AN EMITTER-CELL FOR MEASURING GAS CONCENTRATION BY MEANS OF ULTRASONICS [MAETGIVARE FOER GASKONCENTRATION MED ULTRALJUD]
Goeran Olofsson and Lars Hedlund Oct. 1980 21 p In SWEDISH
(FOA-C-40124-C2(B2)) Avail: NTIS HC A02/MF A01

Measurements of the velocity of sound in mixtures of halon (CBrF3) were made. The factors which influence its applicability are the physical properties of the gas, such as its density and the kinetic state of the molecules, and the required sensitivity. It is desirable to be able to control pressure and temperature in measurements. Author (ESA)

N82-10816 Texas Univ. at Arlington.
COVARIANCE FUNCTIONS AND RELATED STATISTICAL

PROPERTIES OF ACOUSTIC BACKSCATTERING FROM A RANDOMLY ROUGH AIR-WATER INTERFACE Ph.D. Thesis
Gary Ray Wilson 1981 290 p
Avail: Univ. Microfilms Order No. 8119399

The study was limited to backscattered sound (reverberation) from a pulsed sound source. The experimental study employed nine vertically separated receivers and four horizontally separated receivers in order to examine the spatial and temporal covariance of the backscattered sound for both orientations simultaneously. Approximately 1000 narrowband reverberation returns were generated by repetitively projecting a 100 CW pulse centered at 80 kHz at the wind-roughened surface of a freshwater lake at a 10.5 degree grazing angle. The returns were sampled digitally for a 10 ms interval during which surface reverberation was predominant, and were formed into ensembles at each sample time. Various univariate moments and the time-difference component of the covariance were computed experimentally utilizing ensemble averages. The statistical validity of the ensembles was determined by testing each ensemble for randomness and homogeneity. Dissert. Abstr.

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N82-10817 Wisconsin Univ. - Madison.
THE EFFECT OF MICROSTRUCTURE ON THE SPATIAL DISTRIBUTION OF THE DAMAGE PRODUCED BY IONS IN SOLIDS Ph.D. Thesis
Hosny M. Attaya 1981 214 p
Avail: Univ. Microfilms Order No. 8115976

A three dimensional Monte Carlo model, HERAD, is described The model developed to study the ranges and the damage of ions in materials, incorporates the options to use a large number of nuclear and electronic stopping models. The results of the HERAD model were compared to the other current computational models, and the effect of cavities on the range as well as the distribution of damage was studied. The HERAD code yields a close agreement between experiments and theory than other computational models. The code is also shown to be less expensive to run and more versatile than present Monte Carlo codes for radiation damage calculations. A reduction of more than 80% of the LSS electronic cross section was found to produce better agreement between theory and experiment. Dissert. Abstr.

N82-10818 Polish Academy of Sciences, Warsaw. Inst. Podstawowych Problemow Techniki.
THE THEORY OF ORIENTED NUCLEATION WITH ASYMMETRIC SINGLE ELEMENTS. 1: EQUILIBRIUM ORIENTATION DISTRIBUTION
Andrzej Ziabicki and Leszek Jarecki 1981 36 p refs
(ISSN-0208-5658) Copyright. Avail: Issuing Activity

It is shown that the classical theory of nucleation can not be used to discuss phase transitions in preoriented systems of asymmetric particles, and a revised theory of nucleation is proposed. The proposed theory converges qualitatively to the classical one for the isotropic systems of asymmetric particles, providing an explansion for the apparent validity of the classical approach for such systems. T.M.

N82-10819 Texas Univ. at Arlington.
QUANTUM FIELD THEORY AND QUANTIZED DETECTORS IN STATIONARY COORDINATE SYSTEMS Ph.D. Thesis
John Robert Letaw 1981 176 p
Avail: Univ. Microfilms Order No. 8119326

Quantization of the massive scalar field in the stationary coordinate systems of flat spacetime was performed with the aim of determining whether a reasonable particle interpretation and definition of the vacuum can be made in these systems. Canonical quantization proceeds along standard lines. It is found that there are only two distinct vacua in flat spacetime, the usual vacuum of Minkowski coordinates and the vacuum found by Fulling in Rindler coordinates. The Fulling vacuum is always associated with coordinate systems having event horizons and the Minkowski vacuum with those which do not. The proposition that the vacuum state is a coordinate system is that state of the field in which an Unruh box on a coordinate line is unexcited is examined. By explicit calculations of the excitation spectra on the stationary world lines it is shown that a detector is excited in the canonical vacuum if the system is not static. In addition to not defining the vacuum, these detectors cannot even be considered to be particle detectors because they are excited without the presence of canonical particles. Dissert. Abstr.

N82-10820 Texas Univ. at Dallas.
PHOTOLYTIC SPECTROSCOPY OF CsKr EXCIMERS AT VISIBLE WAVELENGTHS Ph.D. Thesis
Hossein Golnabi 1981 155 p
Avail: Univ. Microfilms Order No. 8118235

Two dye lasers were aligned so that the first laser pulse excited the parent Cs-Kr molecules, and the second pulse, delayed about 3 nsec, was used to excite dissociated products to Cs Rydberg states which could readily be ionized and result in positive ions. The detection of ions was accomplished through the inclusion of a space charge limited diode in an absorption cell. Relative cross sections for the selective photolysis of Cs-Kr molecules into the 6 2 P and 5 2 D states of Cs atoms over the 6600 A wavelength region were obtained. The observed spectrum seems to be concentrated in three bands correlating with the red, yellow, and blue bands. Except for the red bands near wavelength 6330 A and the small bond near 4537 A, the similarity between the photolysis bands of Cs2 and Cs-Kr molecules was considerable. Interpretation of the results required the consideration of the photolysis of both the CsKr excimers and Cs2Kr molecules in the photolysis spectra. Analysis of the spectra indicated that the small red satellite 6d sigma and the blue satellite 5d sigma were the result of the photolysis of CsKr excimers and the other bands could be the result of the photolysis of the Cs2Kr along the Cs-Cs band. Dissert. Abstr.

N82-10821 Indiana Univ., Indianapolis.
EXCHANGE CURRENT CONTRIBUTIONS TO QUASI-ELASTIC ELECTRON SCATTERING Ph.D. Thesis
Joe S. Conte, Jr. 1981 125 p
Avail: Univ. Microfilms Order No. 8119044

The effects of exchange currents in an anomalous region of large electron energy loss were calculated using the standard Feynman graph rules. All important long range exchange currents (pair, pionic, and isobar exchange currents) were included. The resulting multidimensional integrals were done using Monte Carlo techniques. All exchange currents which were investigated were found to be appreciable in the anomalous region, and also important in the quasi-free peak region. Dissert. Abstr.

N82-10822 Texas A&M Univ., College Station.
PARTIAL WAVE ANALYSIS OF INELASTIC TWO-NUCLEON COLLISIONS Ph.D. Thesis
James Henry Gruben 1981 125 p
Avail: Univ. Microfilms Order No. 8118264

The fraction of the incoming flux which is scattered inelastically in a nucleon-nucleon reaction below 800 MeV is determined by a theoretical approach. The scattering amplitude for the NNpi final state, the dominant channel, is presented in an angular momentum basis. This partial wave helicity amplitude projects the angular momentum states from a plane wave amplitude derived elsewhere. A computer program was written to evaluate the partial wave amplitudes, from which the cross sections of certain initial angular momenta are calculated. Finally, the inelasticities of an initial NN reaction proceeding from isospin 0 and isospin 1 states are found. The computed inelasticities are generally consistent with existing phase shift analyses. Due to the dominance of the delta intermediate state, all of the isospin 1 results are significant. The only important isospin 0 yields, which proceed through the nucleon intermediate state, are those for (3)S1, (3)D1, and (1)P1 partial waves. At high angular momenta, the one-pion-exchange mechanism dominates the process, and the nucleons may be considered as pointlike particles. Dissert. Abstr.

N82-10823 Texas Univ. at Arlington.
QUANTUM ERGODICITY IN MODEL MOLECULAR SYSTEMS: A STUDY OF THE WIGNER DISTRIBUTION Ph.D. Thesis
John Steven Hutchinson 1981 182 p
Avail: Univ. Microfilms Order No. 8119308

Quantum mechanical wave functions of model molecular systems were analyzed for the statistical mechanical property of ergodicity. Quantum ergodicity was analyzed by calculating the Wigner phase space distribution for each wave function. Three variations of the model Henon-Heils system which models the vibrations in a linear triatomic molecule were studied. Both stationary and non-stationary wave functions of this system were calculated as expansions over a harmonic oscillator product basis set. A technique was developed for calculating the Wigner distributions for such wave functions. These were analyzed for uniformity as an indication of quantum ergodicity. A close correspondence was developed between the concepts of classical and quantum ergodicity. The classical features of KAM behavior and trajectory instability were shown to have relevance to quantum mechanical systems. Implications of the classical quantum correspondence and comparisons of this study to previous quantum ergodic studies are discussed. Dissert. Abstr.

N82-10824 Indiana Univ., Indianapolis.
CONFIGURATION INTERACTION APPROACH TO THE STUDY OF DIATOMIC MOLECULES Ph.D. Thesis
Fernando Rei Ornellas 1981 146 p
Avail: Univ. Microfilms Order 8119071

A series of computer programs for very accurate calculations of energies and wavefunctions for diatomic molcules were designed and implemented on the CDC 6600 computer. The problem of calculating the energy and wavefunction is approached by the configuration interaction method using a very large set of Slater type functions. When possible, advantage is taken of the symmetry of the problem to make the calculation less time consuming. Worthy of note in the programs are the very efficient routines developed for the calculation of two electron integrals; they are cut-of-core charge distribution oriented and allow for the calculation of very large blocks of integrals. Aiming also at the accuracy of the calculation, a procedure for constructing an optimum set of functions to be used in the wave function expansion was developed. This set is optimum in the sense that a significant energy improvement is obtained for a relatively short wavefunction expansion. Results for the ground state of the lithium hydride molecule are presented together with a discussion of the different levels of approximation. Dissert. Abstr.

N82-10825# Oakland Univ., Rochester, Mich. Dept. of Physics.
ANALYSES FOR MECHANICAL STABILITY FOR SYSTEMS OF IONS AND ATOMS ASSOCIATED WITH RINGS, CAGES, AND CRYPTS Technical Progress Report
J. M. McKinley and P. P. Schmidt 2 Aug. 1981 33 p refs Submitted for publication
(Contract N00014-77-C-0293; NR Proj. 359-648)
(AD-A103995; TR-8) Avail: NTIS HC A03/MF A01 CSCL 07/2

There exist examples of systems in which small, simple metallic cations are associated with ring-like molecules (e.g., aromatic radical anions), with aggregates of molecules which encage the ion (e.g., solvation and coordination), or special molecules which trap ions within the molecular structure (crypts). For each of these examples, the harmonic oscillations of the ion in the presence of the molecular structure can be observed. Moreover, in many instances, the stability of the ionic motions in the presence of the molecular structure is important in considering some form of transport process which is associated with the ion. In this paper we present an analysis of the mechanics of the motion of an ion under the influence of various molecular structures. For our analyses, we use a form of symmetry-adapted Taylor series which we recently developed. We determine the positions of equilibrium for the ion in the presence of a continuous ring, a polygon and a polyhedron of sourses for the pair-wise forces. We also determine the states of stability for the positions of equilibrium through an examination of the second order terms in the Taylor series. GRA

N82-10826# Massachusetts Inst. of Tech., Cambridge.
LOWEST ENERGY ELECTRONIC STATES OF RARE EARTH MONOXIDES Final Scientific Report, 1 Jan. 1977 - 15 Aug. 1980
Robert W. Field Hanscom AFB, Mass. AFGL 1 Sep. 1980 102 p refs
(Contract F19628-77-C-0061; AF Proj. 2303)
(AD-A104039; AFGL-TR-80-0328) Avail: NTIS HC A06/MF A01 CSCL 07/4

The electronic spectra of the rare earth monoxides have been nearly intractable for two reasons: There is a tremendous number of molecular electronic states (typically more than 100) expected to occur below 3eV, these states all have nearly identical rotational and vibrational constants (to within 2%) and are, therefore, not readily distinguishable from each other. It has been necessary to develop laser spectroscopic methods which are capable of resolving and dealing unambiguously with complex spectra, recognizing individual electronic states and organizing them into partial energy level diagrams, and linking partial level diagrams for groups of states which, because of selection-rule restrictions, involve mostly disjoint groups of electronic states. In order to provide information of value to either thermochemists or theoreticians, it is important to know that all of the lowest energy electronic states have been found. To this end, a crystal field model, which relates the molecular energy levels to those of the free m+2 ion, has been developed and tested for the 4f6s configuration of CeO. GRA

N82-10827# Los Alamos Scientific Lab., N. Mex.
POSITIVE-PION DOUBLE-CHARGE-EXCHANGE REACTION: EXPERIMENTS ON THE ISOTOPIC PAIRS OXYGEN-16, 18 AND MAGNESIUM-24, 26 Ph.D. Thesis Texas Univ., Austin
Steven Joseph Greene Jun. 1981 141 p refs
(Contract W-7405-eng-36)
(DE81-028515; LA-8891-T) Avail: NTIS HC A07/MF A01

Energy excitation functions of d sigma/d lambda, across the (3,3) (LC omega) -N resonance, are presented for transitions to double isobaric analog state (DIAS) and non-DIAS ground state residual nuclei. Angular distributions in the region of 5 deg. to 33 deg. are presented for the DIAS from the T = 1 nuclei. The similarities and differences of DIAS and non DIAS distributions in reaction mechanism and nuclear structure effects are discussed. Also, a two-amplitude model for the 18 o excitation function consistent with the data is presented. DOE

N82-10828# Consolidated Controls Corp., Bethel, Conn.
NEUTRON-ACTIVATION ANALYSIS OF TURBINE DEPOSITS Interim Report
Aug. 1981 65 p refs Sponsored in part by EPRI
(EPRI Proj. 1409)
(DE81-904189; EPRI-CS-1958) Avail: NTIS HC A04/MF A01

A noninstrusive system employing the associated particle time of flight technique was examined. The inelastic gamma rays induced by 14 MeV neutrons incident upon corrodent elements deposited upon the blades of an operating steam or combustion turbine was determined. Measurements of steam and combustion turbine blades with simulated corrodent chemicals demonstrated that deposits of Na2S03, NaCl, and Na2P04 as small as 10(+3) g/sqcm are detected by this technique. DOE

N82-10829# Rochester Univ., N. Y.
LOW-ENERGY ION-MOLECULE REACTION DYNAMICS AND CHEMIIONIZATION KINETICS Progress Report, 1 Feb. 1981- 31 Jan. 1982
James M. Farrar 1981 8 p refs
(Contract DE-AS02-78ER-04694)
(DE81-030040; DOE/ER-04694/T1) Avail: NTIS HC A02/MF A01

Experiments in photodissociation of organic cations to study the competition between isomerization and fragmentation and low energy proton transfer reactions of HCO(+) with selected neutrals are described. The former area provides a sideline to combustion studies of proton transfer in hydrocarbon flames, but the question of energy transfer in highly excited gas phase ion impacts directly upon questions closely related to the fate of ions in combustion. The latter area, currently in progress,

focuses upon the dynamics of biomolecular reactions of direct relevance to combustion. DOE

N82-10830# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Physics.
EXOTIC ATOMS, K-NUCLEUS SCATTERING AND HYPER-NUCLEI
P. D. Barnes 1981 18 p refs Presented at 9th Intern. Conf. on High Energy Phys. and Nucl. Structure, Versailles, France, 6-10 Jul. 1981
(Contract DE-AS02-76ER-03244)
(DE81-027957; DOE/ER-03244/T3; COO-3244-84; CONF-810747-2) Avail: NTIS HC A02/MF A01

Progress in exotic atom physics, kaon nucleus scattering, and hypernuclear physics is reviewed. Specific problems discussed include searches for muon-nucleon interactions beyond QED, a comparison of data and recent calculation of K(+) + (12)C elastic and inelastic scattering, and studies of (UC omega) and (delta) hypernuclei and data on the level structure of (13)C/ (delta). DOE

N82-10831# Texas Univ., Austin. Center for Particle Theory.
RESEARCH PROGRAM IN ELEMENTARY-PARTICLE THEORY Progress Report
E. C. G. Sudarshan and Y. Neeman 1981 78 p
(Contract DE-AS05-76ER-03992)
(DE81-028454; DOE/ER-03992/452) Avail: NTIS HC A05/MF A01

Progress is reported: the physics of ultra high energies and cosmology, the phenomenology of particle physics, composite models of particles and quantum field theory, quantum mechanics, geometric formulations, fiber bundles, and other algebraic models. DOE

N82-10832# Wesleyan Univ., Middletown, Conn. Dept. of Physics.
COLLISION CROSS SECTIONS AND EQUILIBRIUM FRACTIONS OF IONS AND ATOMS IN METAL-VAPOR TARGETS Progress Report, 1 Jun. 1980 - 30 Apr. 1981
Thomas J. Margan 1981 4 p refs
(Contract DE-AC02-76ET-53048)
(DE81-027886; DOE/ET-53048/T1; COO-4022-4) Avail: NTIS HC A02/MF A01

Atomic collision cross sections and equilibrium fractions of ions and atoms in metal vapor targets were measured. In the development of negative ion sources, D(+) formation cross sections were measured in alkaline-earth metal vapor targets. Electron transfer cross section measurements of D( ) ions and DO atoms in collision with calcium and strontium vapor and differential cross section measurements for H(+) formation in H( ) + Mg collisions were completed. DOE

N82-10833# Florida State Univ., Tallahassee.
SELECTIVE EXCITATION, RELAXATION, AND ENERGY CHANNELING IN MOLECULAR SYSTEMS Progress Report, 1 Dec. 1980 - 30 Nov. 1981
William C. Rhodes 1981 14 p
(Contract DE-AS05-78o-5784)
(DE81-028658; DOE/OR-05784/1) Avail: NTIS HC A02/MF A01

The role of the intensity of laser coupling with a molecule on the dynamics and selectivity of nonradiative processes was studied theoretically and quantitatively in terms of computer simulations for some simple multistate models. This complements existing results which emphasize frequency selectivity of photochemical and photophysical processes. The stochastic effects of the molecular medium (bath) were formulated in terms of molecular energy surfaces for the molecule-bath modes and the associated sudden potential. This leads to a better understanding of the microscopic quantum bases for stochastic modulation effects on resonance emission of light. Two distinct kinds of molecular resonances (termed dissipative and stochastic) were formulated in terms of prototype coupling schemes for a molecule and the modes to which it is coupled. A coupling strength ordering rule was developed which explains the propensity for kinetic slowing effects due to background interactions. The tendency for stochastic modulation to induce sequential and parallel resonances was discovered. DOE

N82-10834# Ames Lab., Iowa. Physics Dept.
APPLICATIONS OF MOMENT METHODS TO FINITE NUCLEI
J. P. Vary 1981 9 p refs Presented at the 2nd Intern. Conf. of Recent Progr. in Many-Body Theories, Mexico City, 12-17 Jan. 1981
(DE81-023788; IS-M-320; CONF-810107-5) Avail: NTIS HC A02/MF A01

Many-body problems utilizing moment methods are summarized. Some tests with valence particle systems and some tests with the soluble Lipkin-Meshkov-Glick Hamiltonian are developed to assess accuracy of the moment method approach for finite nuclei. Results for the blinding energy and for the elastic electron scattering cross sections of O using a realistic microscopic no-core effective Hamiltonian are presented. DOE

N82-10835# Argonne National Lab., Ill. Applied Physics Div.
NEUTRON STRENGTH FUNCTIONS: THE LINK BETWEEN RESOLVED RESONANCES AND THE OPTICAL MODEL
P. A. Moldauer 1980 17 p refs Presented at the Workshop on Nucl. Data Evaluation Methods and Procedures, Upton, N.Y., 22-25 Sep. 1980
(Contract W-31-109-eng-38)
(DE81-023896; CONF-800979-18) Avail: NTIS HC A02/MF A01

The use of neutron strength functions and scattering radii as energy and channel radius independent parameters characterizing neutron scattering resonances and provide a connection between R-matrix resonance analysis and the optical model is considered. The choice of R-matrix channel radii is discussed, as are limitations on the accuracies of strength functions. New definitions of the p-wave strength function and scattering radius are proposed. For light nuclei, where strength functions display optical model energy variations over the resolved resonances, a doubly reduced partial neutron width is introduced for more meaningful statistical analyses of widths. The systematic behavior of strength functions and scattering radii is discussed. DOE

N82-10836# Argonne National Lab., Ill. Applied Physics Div.
DATA INTERPRETATION, OBJECTIVE EVALUATION PROCEDURES AND MATHEMATICAL TECHNIQUES FOR THE EVALUATION OF ENERGY DEPENDENT RATIO, SHAPE AND CROSS SECTION DATA
W. P. Poenitz 1980 39 p refs Presented at Workshop on Nucl. Data Methods and Procedures, 22-25 Sep. 1980
(Contract W-31-109-eng-38)
(DE81-023897; CONF-800979-19) Avail: NTIS HC A03/MF A01

The evaluation of several energy dependent neutron cross sections which are of importance for practical applications is considered. The evaluation process is defined as the procedure which is used to derive the best knowledge of these cross sections based on the available direct experimental data information, and, using theoretical models, on the auxiliary data base. The experimental data base represents a multiple overdetermination of the unknown cross sections with various correlations between the measured values. Obtaining the least squares estimator is considered as the standard mathematical procedure to derive a consistent set of evaluated cross section values. Various approximations made in order to avoid the monstrous system of normal equations are considered and the feasibility of the result, its reliability and the improvements obtained in iterative steps are discussed. The inclusion of auxiliary supplementary information is considered. DOE

N82-10837# Argonne National Lab., Ill.
CASE FOR EXOTIC BARYON-BARYON STATES
Gerald H. Thomas 1980 12 p refs Presented at the Intern. Symp. on High Energy Phys. with Polarized Beams, Lausanne, Switzerland, 25 Sep. - 1 Oct. 1980
(Contract W-31-109-eng-38)
(DE81-024458; ANL/HEP/CP-80-75; CONF-800994-18) Avail: NTIS HC A02/MF A01

Three main points are presented. Current theoretical prejudices are presented for why dibaryon states are interesting, and why they should be expected. A review is given of some of the unsettled experimental issues which emerged during this conference concerning dibaryons. Phenomenological issues are

raised which are critical to understanding whether dibaryon states are observable in the medium energy NN system. DOE

N82-10838# Argonne National Lab., Ill.
FOIL DISSOCIATION OF FAST MOLECULAR IONS INTO ATOMIC EXCITED STATES
H. G. Berry, T. J. Gay, and R. L. Brooks 1980 6 p refs Presented at the 6th Conf. on the Appl. of Accelerators in Res. and Ind., Denton, Tex., 3-5 Nov. 1980
(Contract W-31-109-eng-38)
(DE81-023805; CONF-801111-49) Avail: NTIS HC A02/MF A01

The intensity and polarizations of light emitted from atomic excited states of dissociated molecular ions were measured. The dissociations were induced by transmitting fast molecular ions (50 to 500 keV/amu) through thin carbon foils. A calculation of multiple scattering and the Coulomb explosion gives the average internuclear separation of the projectile at the foil surface. Experimentally, the foil thickness was varied to give varying internuclear separations at the foil surface and observe the consequent variation in light yield and optical polarization. Using HeH(+) projectiles, factors of 1 to 5 enhancements of the light yields from He I and some He II and H I emissions were observed. The results suggest a short range surface interaction of the electron pick-up followed by a slow molecular dissociation. Alignment measurements confirm the essential features of the model. Observation of Lyman alpha emission after dissociation of H2(+) and H3(+) show rapid variations in light yield for small internuclear separations at the foil surface. DOE

N82-10839# Illinois Univ., Urbana. Coll. of Liberal Arts and Sciences.
NEUTRON-ACTIVATION ANALYSIS OF SEVERAL US GEOLOGICAL SURVEY AND NATIONAL BUREAU OF STANDARDS REFERENCE MATERIALS B.S. Thesis
Andrew Thomas Daly 1981 38 p refs
(Contract DE-AC02-80EV-10403)
(DE81-025041; DOE/EV-10403/3) Avail: NTIS HC A03/MF A01

The homogeneity of geological reference samples was analyzed to improve the quality of elemental concentration data available on these materials, or use in a verification of factor analysis source resolution procedures. The analyses was performed by instrumental neutron activation analysis (INAA). The INAA has high sensitivity which is attained in determining elemental concentrations. The basic theory and technique are reviewed to show where problems can arise and how thay can be dealt with. DOE

N82-10840# Argonne National Lab., Ill.
A SIX TESLA ANALYZING MAGNET FOR HEAVY-ION BEAM TRANSPORT
R. P. Smith, L. Bollinger, J. Erskine, L. Genens, and J. Hoffman 1980 4 p ref Presented at the Appl. Superconductivity Conf., Santa Fe, N. Mex., 29 Sep. - 3 Oct. 1980 Submitted for publication
(Contract W-31-109-eng-38)
(DE81-023922; CONF-800980-39) Avail: NTIS HC A02/MF A01

A superconducting analyzer magnet for particle beam deflection was designed and is being fabricated for use at the Argonne tandem linac accelator system (ATLAS). This six tesla magnet will provide 45 deg of deflection fo the heavy-ion beams from the ATLAS tandem electrostatic accelerator and together with its twin will replace the existing conventional 90 deg analyzer magnet which will become inadequate when ATLAS is completed. DOE

N82-10841# Brookhaven National Lab., Upton, N. Y.
NEUTRON SCATTERING MEASUREMENTS OF LOW-TEMPERATURE HYDROGEN TUNNELING IN NIOBIUM
H. Wipf (Universitaet Muenchen), A. Magerl (National Bureau of Standards, Washington, D.C.), S. M. Shapiro, S. K. Satija, and W. Thomlinson 1981 9 p refs Presented at the Intern. Symp. on Metalhydrogen Systems, Miami Beach, Fla., 13 Apr. 1981 Sponsored in part by Bundesministerium fuer Forsch. und Technol.
(Contract DE-AC02-76CH-00016)
(DE81-025095; BNL-28332; CONF-810497-2) Avail: NTIS HC A02/MF A01

Low-temperature (0.09 K and 5 K) neutron spectroscopic measurements are presented demonstrating the existence of H tunneling states for O-H pairs in NbO0 013H0 016. From the results, a tunneling matrix element of (0.19 + or - 0.04) meV, and an estimate for the strain-induced interaction between different O-H pairs are obtained. These experiments show H tunneling in a metal. They contribute to an understanding of H diffusion, for which tunneling is considered to play an important role. DOE

N82-10842# Research Inst. of National Defence, Stockholm (Sweden). Huvudavdelning 2.
BAC: A COMPUTER PROGRAM FOR CALCULATING SHIELDING IN BUILDINGS AGAINST INITIAL RADIATION [BAC - ETT DATORPROGRAM FOER BERAEKNING AV BYGGNADERS SKYDDSFAKTORER FOER INITIALSTRAALNING]
Goeran Danielson Oct. 1980 51 p refs In SWEDISH
(FOA-C-20376-A2) Avail: NTIS HC A04/MF A01

Calculation methodology and transmission data for BAC in the event of a nuclear explosion are considered. The shielding factor is the rate between the radiation dose at one point in the building and the dose in open air. It is separately calculated for neutrons, gamma rays from fission products, and secondary gamma rays. For this calculation, BAC uses data for radiation transmission in concrete. This program is utilized for fallout shelters and other buildings where walls and floors/roofs are mostly made of concrete and bricks. Instructions for the program are given, and BAC results and values are in certain cases compared with those obtained with the Monte Carlo method. Author (ESA)

N82-10843# Research Inst. of National Defence, Stockholm (Sweden). Huvudavdelning 2.
HINK: AN INTERACTIVE COMPUTER PROGRAM GIVING DATA FOR THE BAC RADIATION SHIELDING PROGRAM [HINK - ETT DATORPROGRAM FOER ATT INTERAKTIVT SKAPA INDATA TILL STRAALSKYDDSPROGRAMMET BAC]
Lisbeth Pers, Kristina Laurin, and Eva Elvers Oct. 1980 59 p refs In SWEDISH
(FOA-C-20377-A2) Avail: NTIS HC A04/MF A01

This computer program considers a building which is a right angle parallelepiped with rooms on several levels and openings in the outside and inside walls. This geometrical data, complemented by other physical data, compose the in-data for the BAC program which calculates shielding factors for initial radiation of buildings. Instructions for the use of HINK are given and how the data for houses should be handled and controlled is shown. The principle of interaction is explained with programming methods. Author (ESA)

N82-10844# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
MEASUREMENT OF INTEGRAL EXCITATION CROSS SECTIONS DURING ALKALI RARE GAS COLLISIONS Thesis [MESSUNG INTEGRALER ANREGUNGSQUERSCHNITTE BEI ALKALI-EDELGAS-STOESSEN]
Helmut Joswig Dec. 1979 97 p refs In GERMAN
(MPIS-26/1979; ISSN-0436-1199) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 17,55

For collisions in the energy range 50 to 10,000 eV, emitted light was measured, and a spectral analysis of the fluorescent light from 1450 to 9000 A was performed. The spectrometer setup and measurement techniques are described. Measurement data collection and processing are discussed, including an error analysis. Experimental results are presented. The diabatic Born approximation for a three-particle model under the influence of electronic excitation is then formulated and used to calculate scattering cross sections. Experimental results are critically reviewed. Author (ESA)

N82-10845# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
INVESTIGATIONS OF THE VIBRATIONAL AND ROTATIONAL EXCITATION OF N2, CO, NO, O2, CO2, CH4, CF4

AND SF6 DURING COLLISION WITH PROTONS AND DEUTERONS AT AN ENERGY OF 9.8 eV Ph.D. Thesis - Georg-August Univ. [UNTERSUCHUNGEN ZUR VIBRATIONS- UND ROTATIONSANREGUNG VON N2, CO, NO, O2, CO2, CH4, CF4 UND SF6 BEIM STOSS MIT PROTONEN UND DEUTERONEN VON 9, 8 eV ENERGIE]
Uwe Gierz Jun. 1980 207 p refs In GERMAN
(MPIS-9/1980; ISSN-0436-1199) Avail: NTIS HC A10/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 32.70

Inelastic collision processes of the class H(+) + AB(O,O) yields H(+) + AB(J,V) + Delta (translation energy), with (J,V) the excited state, were studied, experimentally. The measurements show varying results, in such a way that an unified interpretation is impossible. The strong vibrational excitation of O2 is characteristic. A series of models that deal with energy transmission processes are discussed. Only for NO and O2 do measurements agree, at least qualitatively, with theoretical predictions at hand. Trajectory calculations lead only in rare cases to usable results. Better calculation methods for the systems considered are called for.
Author (ESA)

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation*.

N82-10846# California Univ., Berkeley. Lawrence Berkeley Lab. Particle Data Group.
COMPILATION OF CURRENT HIGH-ENERGY PHYSICS EXPERIMENTS
C. G. Wohl, R. L. Kelly, F. E. Armstrong, C. P. Horne, M. S. Hutchinson, A. Rittenberg, T. G. Trippe, G. P. Yost, L. Addis (Stanford Linear Accelerator Center, Calif.), C. E. W. Ward (Argonne National Lab., Ill.) et al May 1981 32 p Sponsored in part by NSF
(Contract W-7405-eng-48)
(DE81-028585; LBL-91-Rev-5-81) Avail: NTIS HC A03/MF A01

The compilation of current high energy physics experiments is presented. The compilation includes summaries of all high energy physics experiments that were approved before April 1981, and had not completed data recording by 1 January 1977. DOE

N82-10847# Rockwell International Corp., Richland, Wash. Material Sciences Group.
CHARACTERISTICS OF CANDIDATE GEOLOGIES FOR NUCLEAR WASTE ISOLATION: A REVIEW
R. G. Johnston 15 Aug. 1981 86 p refs
(Contract DE-AC09-79ET-41900)
(DE81-030153; DOE/ET-41900/6) Avail: NTIS HC A05/MF A01

The stratigraphy, chemical and mineral composition, hydrology, and physical properties of rock types are summarized. Basalt, granite, salt, shale, and tuff formations are proposed as sites for geologic disposal of high level nuclear waste. The choice of site affects the design of the waste package and the accompanying engineered barriers. It is emphasized that it is important to know the general properties of each type of repository rock to tailor an effective waste isolation system. DOE

N82-10848# Rockwell International Corp., Canoga Park, Calif. Dept. of Systems Engineering.
PREPARATION OF NONRADIOACTIVE SUBSTITUTES FOR RADIOACTIVE WASTES
M. J. Kupfer 31 Jul. 1981 56 p refs
(Contract DE-AC09-79ET-41900)
(DE81-028502; DOE/ET-41900/8; ESG-DOE-13352) Avail: NTIS HC A04/MF A01

Procedures for preparing simulated nuclear wastes that exhibit physical and chemical properties similar to those of actual wastes are given. The synthetic wastes were formulated using conditions similar to those defined in the original process flowsheets. Recipes suitable for laboratory-scale or pilot-scale preparation are given for wastes found at the Savannah River Plant, Hanford Site, Idaho Chemical Processing Plant, and the Western New York Nuclear Service Center facility. Recipes are also given for waste that is likely to be generated from future reprocessing of spent commercial nuclear fuels. DOE

N82-10849# Minnesota Univ., Minneapolis. School of Physics and Astronomy.
EXPERIMENTAL AND THEORETICAL HIGH ENERGY PHYSICS Progress Report, 1 Oct. 1980 - 30 Jun. 1981
1981 46 p refs
(Contract DE-AC02-76ER-01764; EY-76-C-02-1764)
(DE81-029024; DOE/ER-01764/T2) Avail: NTIS HC A03/MF A01

A high energy physics program is reviewed. The Soudan-1 baryon decay experiment was converted from a concept demonstrated by a small prototype into a working experiment, which yielded data about underground cosmic ray events. Data on direct photon production in pion nucleus and proton nucleus collisions were obtained that exists a signal exists for direct photon events at transverse momenta as large as 4 GeV/c. The mechanisms for inclusive hyperon polarization and precision measurements of the hyperon magnetic moments are analyzed.
DOE

N82-10850# Sandia Labs., Albuquerque, N. Mex.
CHARACTERIZATION OF AN ACCELERATOR DESIGNED TO STUDY ELECTRON BEAM UNIFORMITY IN LARGE DIODES
E. L. Patterson, R. Hamil, and J. J. Ramirez 1981 16 p refs Presented at 3d IEEE Intern. Pulsed Power Conf., Albuquerque, N. Mex.
(Contract DE-AC04-76DP-00789)
(SAND-81-0844C; CONF-810659-2) Avail: NTIS HC A02/MF A01

Results are described of initial tests on an accelerator designed to investigate electron beam control and uniform excitation of large volume lasers. For these tests the accelerator is operated in the 50 nsec mode with diode voltages and currents up to 1 MV and 500 kA. The cathode emitting surface is a 30 cm x 105 cm carbon felt material. The diode is immersed in a nearly axial applied magnetic field variable from 0 to 3.7 kG. The spatial distribution of current is monitored by time resolved photography of Cherenkov radiation emitted by a dielectric converter plate placed perpendicular to the beam propagation direction. Diode performance is monitored as a function of the magnitude of the applied magnetic field. DOE

N82-10851# Argonne National Lab., Ill.
CARBON STRIPPER FOILS FOR HEAVY-ION ACCELERATORS
G. E. Thomas 1980 6 p refs Presented at the 6th Conf. on Appl. of Accelerators in Res. and Ind., Denton, Tex., 3-5 Nov. 1980; sponsored by the American Physical Society
(Contract W-31-109-eng-38)
(DE81-023802; CONF-801111-46) Avail: NTIS HC A02/MF A01

With the development of heavy ion accelerators and the resulting use of heavier ions, the carbon stripper foil lifetimes are greatly reduced. Even when using the new foils changer systems, which typically contain two hundred foils or more, it becomes necessary to have frequent accelerator shutdowns for foil reloading. Several techniques were tried with varying degrees of success to strengthen these foils so that they will last longer; the most successful one reported a lifetime increase of the order of a factor of 30 over foils produced in the conventional manner. Methods of producing various types of foils, theories for foil breakage, and ideas will be for further increasing foil lifetimes are discussed. DOE

N82-10852# Brookhaven National Lab., Upton, N. Y. Dept. of Physics.
COMMENTS ON THE LINEAR SYSTEM FOR THE SELF DUAL YANG-MILLS FIELDS
Ling-Lie Chau Wang 1981 16 p refs Presented at the 18th Winter School of Theoret. Phys., Karpacz, Poland, 18 Feb. - 4 Mar. 1981

(Contract DE-AC02-76CH-00016)
(DE81-025076; BNL-29548; CONF-810257-1) Avail: NTIS HC A02/MF A01

One way of linearizing the self dual Yang-Mills equations using the infinite nonlocal currents, the properties of such linear systems and the solutions to such linear equations in the case of n-instanton with (5n+4) parameters are discussed. The connection with the linear system of Belavin-Zakharov, and the Atiyah-Ward construction for the self dual Yang-Mills equation. DOE

N82-10853# Princeton Univ., N. J. Plasma Physics Lab.
POSSIBLE NON-HYDROGEN NEUTRALIZERS FOR HIGH ENERGY D+ AND H+ BEAMS
L. R. Grisham and D. E. Post Jul. 1981 20 p refs
(Contract DE-AM02-76CH-03073)
(DE81-023134; PPPL-1803) Avail: NTIS HC A02/MF A01

The utility of using a gas other than hydrogen isotopes to neutralize energetic beams of D(+) or H(+) for applications in magnetic confinement fusion was explored. At D(+) energies above 160 keV, helium, relative to hydrogen, offers significant improvements in neutralization efficiency and in enrichment of the full energy component of the beam. Similar advantages accrue with neon at D(+) energies in excess of 200 keV. DOE

N82-10854# Department of Energy, Las Vegas, Nev.
NEVADA NUCLEAR WASTE STORAGE INVESTIGATIONS: QUALITY ASSURANCE PLAN
Apr. 1981 40 p
(DE81-025614; NVO-196-17-Rev-1) Avail: NTIS HC A03/MF A01

This document is the first revision of the Nevada Nuclear Waste Storage Investigations, Quality Assurance Plan (NVO-196-17) published in August 1980. It contains several substantive revisions and numerous minor revisions (e.g., WMPO/NV vs. Project Office, Los Alamos National Laboratory vs. Los Alamos Scientific Laboratory, etc.) which update or clarify the August 1980 document. NVO-196-17 (Rev. 1) supercedes NVO-196-17. DOE

N82-10855# Los Alamos Scientific Lab., N. Mex.
ACCEPTABILITY OF REACTORS IN SPACE
David Buden 1981 10 p refs Presented at the 16th Intersoc. Energy Conversion Eng. Conf., Atlanta, 9-14 Aug. 1981
(Contract W-7405-eng-36)
(LA-UR-81-1371) Avail: NTIS HC A02/MF A01

Nuclear reactors are the key to our future expansion into space. However, there has been some confusion in the public as to whether they are a safe and acceptable technology for use in space. The answer to these questions is explored. The US position is that when reactors are the preferred technical choice, they can be used safely. It does not appear that reactors add measurably to the risk associated with the Space Transportation System. American, Russian, and United Nations investigations into he safety of using nuclear reactors in space are reviewed. DOE

N82-10856# Department of Energy, Las Vegas, Nev.
NEVADA NUCLEAR WASTE STORAGE INVESTIGATIONS. RADIONUCLIDE MIGRATION IN TUFF AND GRANITE: PEER REVIEW DOCUMENTATION
Apr. 1981 87 p
(DE81-769448; NVO-196-23) Avail: NTIS HC A05/MF A01

A compilation of review comments on the geologic and hydrologic investigation of Yucca Mountain is presented. Emphasis is placed on whether Yucca Mountain is a technically acceptable location to site an underground, high level nuclear waste repository. DOE

N82-10857# Department of Energy, Las Vegas, Nev.
NEVADA NUCLEAR WASTE STORAGE INVESTIGATIONS. GEOLOGIC AND HYDROLOGIC INVESTIGATION OF YUCCA MOUNTAIN: PEER REVIEW DOCUMENTATION
Apr. 1981 106 p
(DE81-769447; NVO-196-22) Avail: NTIS HC A06/MF A01

A compilation of review comments on the tuff and granite radionuclide migration investigations is presented. Radionuclide migration/retardation in tuffaceous and granitic rocks in situ the technology for high level nuclear waste handling, containment, and isolation, and whether potentially suitable rock units on or adjoining the Nevada Test Site (NTS) are technically acceptable for a licensed, permanent nuclear waste repository are addressed. DOE

N82-10858# Department of Energy, Aiken, S.C.
STRATEGY DOCUMENT LONG-TERM HIGH-LEVEL WASTE TECHNOLOGY PROGRAM
May 1981 57 p refs
(DE81-026337; DOE/SR/WM-79/3-Rev-5/81) Avail: NTIS HC A04/MF A01

The research and development plan of the Office of Waste Operations and Technology for long-term immobilization of the high-level radioactive wastes resulting from chemical processing of nuclear reactor fuels and targets is presented. The basic plan to achieve the goal of immobilizing all US nuclear high-level wastes (HLW) for terminal storage is to develop technology to support a realistic choice of an isolation system for each site, to provide design data for full-scale facilities, and to construct and operate the facilities necessary to immobilize the DOE defense wastes. Plans for an HLW immobilization plant at the Savannah River Plant are presented. DOE

74 OPTICS

Includes light phenomena.

N82-10859 California Inst. of Tech., Pasadena.
A1GaAs OPTOELECTRONIC DEVICES FOR OPTICAL COMMUNICATIONS Ph.D. Thesis
Joseph Katz 1981 163 p
Avail: Univ. Microfilms Order No. 8118977

Semiconductor injection laser diodes and related optoelectronic devices which can be used as high sources for optical communication systems are described, and the intrinsic electrical model of the laser diode is developed. The devices were grown from the GaAs-GaAlAs ternary system using the input phase epitaxy technique. The translaser, a monolithically integrated heterostructure bipolar transistor with an injection laser and two devices possessing bistable electrical characteristics (a laser SCR switch and a device consisting of multi-PN heterostructure devices) are described. Each performs an electronic function of modulating the light output of the laser associated with it. Two low threshold single mode laser diodes whose properties make them attractive candidates for sources in optical fiber communication systems, the embedded stripe laser, and a version of the buried heterostructure laser are investigated. An equivalent circuit of the laser diode is presented. This model demonstrates the operation of the laser diode, which is particularly important in applications which involve its high frequency operation with other electronic components and when a modification of its frequency response is needed. Dissert. Abstr.

N82-10860 Rockefeller Univ., New York.
ON THE THEORY OF LIGHT SCATTERING FROM FLUIDS IN NONEQUILIBRIUM STEADY STATES Ph.D. Thesis
Theodore Ross Kirkpatrick 1981 197 p
Avail: Univ. Microfilms Order No. 8118671

The light scattering of a fluid in a nonequilibrium steady state is studied. The effect of long range correlations in the equal time correlation functions on the light scattering are calculated, experimental predictions are made, new experiments are suggested and a comparison with existing experimental results is given. The theory is developed for dilute gases using kinetic theory as well as for fluids of arbitrary densities using a hydrodynamic theory. The long range correlations that exist in nonequilibrium fluids are due to mode coupling effects. The existence of mode coupling effects in fluids far away from a critical point is supported. Other effects predicted theoretically for fluids and so far only found in computer simulation are supported; the long time tails in the time correlation functions that determine the transport coefficients and the nonexistence of a virial expansion for the transport coefficients. Dissert. Abstr.

N82-10861 Texas Univ. at Arlington.
STOCHASTIC SWITCHING IN ABSORPTIVE OPTICAL BISTABILITY Ph.D. Thesis
Robert Frank Gragg 1981 1 p
Avail: Univ. Microfilms Order No. 8119294

The dynamics of a Fabry-Perot cavity filled with a gas of two-level atoms and injected with an external laser beam are examined. The semiclassical Maxwell-Bloch equations are found to show a range of behavior from the second order lasing phase transition to the first order transition of absorptive optical bistability. In the latter case, an adiabatic elimination is performed which removes the mean values of the atomic variables but retains their fluctuations in a stochastic differential equation. The resulting Fokker-Planck equation (which is identical to the one from the quantum optical treatment of the problem) has a bimodal steady state probability density. Transition rates between the metastable states (probability peaks) are calculated by a method originated by Kramers for chemical reaction rates and are compared to mean first passage results and the results of other authors. Dissert. Abstr.

N82-10862*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
REAL-TIME 3D X-RAY AND GAMMA-RAY VIEWER Patent Application
Lo I. Yin, inventor (to NASA) Filed 22 May 1981 21 p
(NASA-Case-GSC-12640-1; US-Patent-Appl-SN-267178) Avail: NTIS HC A02/MF A01 CSCL 20F

A multi-pinhole aperture lead screen forms an equal plurality of invisible mini-images having dissimilar perspectives of an X-ray and gamma-ray emitting object onto a rare-earth phosphor layer which, in turn, provides visible light mini-images directly into a visible light image intensifier. A viewing screen having an equal plurality of dissimilar perspective apertures distributed across its face in a geometric pattern identical to the lead screen, provides a viewer with a real, pseudoscopic image of the object with full horizontal and vertical parallax. NASA

N82-10863# Sandia Labs., Albuquerque, N. Mex. Photometrics and Optical Development Div.
AUTOMATED FRESNEL LENS TESTER SYSTEM
Gary S. Phipps Jul. 1981 71 p
(Contract DE-AC04-76DP-00789)
(DE81-029483; SAND-81-1187) Avail: NTIS HC A04/MF A01

An automated data collection system controlled by a desktop computer for testing Fresnel concentrators (lenses) intended for solar energy applications was developed. The system maps the two dimensional irradiance pattern formed in a plane parallel to the lens, whereas the lens and detector assembly track the Sun. A point detector silicon diode measures the irradiance at each point of an operator defined rectilinear grid of data positions. Comparison with a second detector measuring solar insolation levels results in solar concentration ratios over the image plane. Summation of image plane energies allows calculation of lens efficiencies for various solar cell sizes. DOE

N82-10864# Los Alamos Scientific Lab., N. Mex.
PHOTOEMISSION MEASUREMENTS FOR LOW ENERGY X-RAY DETECTOR APPLICATIONS
Robert H. Day 1981 16 p refs Presented at the Low Energy X-ray Conf., Monterey, Calif., Jun. 181
(Contract W-7405-eng-36)
(DE81-025255; LA-UR-81-1712; CONF-8106108-1) Avail: NTIS HC A02/MF A01

A review of X-ray photoemission measurements in the 50 eV to 10 keV X-ray region is given and the experimental techniques are reviewed. A semiempirical model of X-ray photoemission is discussed and compared to experimental measurements. Examples of absolutely calibrated instruments are shown. DOE

N82-10865# Oak Ridge National Lab., Tenn.
MEASUREMENT OF PEAK TEMPERATURE ALONG AN OPTICAL FIBER
R. J. Fox 29 May 1981 6 p refs
(Contract W-7405-eng-26)
(DE81-023186; DOE/TIC-1023186) Avail: NTIS HC A02/MF A01

The design and operation of a fiber optic line sensor that distinguishes between a long warm region and a short hot zone is described. The sensor is used for the measurement of hot spots in large, high voltage transformers where high electric fields preclude the use of metallic lead wires to join remote readout equipment to the thermocouple or thermistor sensors. The use of a length of fiber to determine remotely the maximum temperature achieved at any point along the length of the fiber, i.e., a distributed line sensor, is considered. DOE

N82-10866# Research Inst. of National Defence, Linkoeping (Sweden). Huvudavdelning 3.
OPTICAL MULTIPLEX TECHNIQUE [OPTISK MULTIPLEX-TEKNIK]
Lars Knutsson Sep. 1980 100 p refs In SWEDISH
(FOA-C-30022-E) Avail: NTIS HC A05/MF A01

Survey and short description is given of the devices reviewed in the literature. About 50 articles and books were analyzed. Stress is laid on duplex-transmission on single fiber and special multimode optical fibers. Recently a fiber material with very low attenuation was produced. Most interesting is the wavelength-multiplex where the different wavelengths represent the different channels. It gives simple multiplexes with good data. Waveguides can be made in the substratum by ion implanting and several components can be placed on the same chip. Description of a duplex telephone coupler on a single-fiber is given. Author (ESA)

N82-10867# Research Inst. of National Defence, Umea (Sweden). Huvudavdelning 4.
REGISTRATION METHODS FOR MEASURING OF LUMINESCENCE-CELL LIGHT BY MEANS OF PHOTOMULTIPLIERS [REGISTREINGSMETODER VID MAETNING AV LUMINESCENCELJUS MED FOTOMUL TIPLIKATORER]
Goeran Hulten and Hans-Goeran Larsson Mar. 1980 27 p refs In SWEDISH
(FOA-C-40109-B2) Avail: NTIS HC A03/MF A01

Photomultipliers (two EMI 9781 R, one EMI 9757 B, and one RCA IP 21) were exposed to light from bioluminescent reactions and from a radioactive light source. The signal was recorded as an analog current (filtration) or by counting the pulses per unit of time (photon counting). With photon counting, an increase by a factor of 1.5, in comparison with conventional filtration, was recorded for the background-noise ratio and for the signal background ratio. An EMI 9757 B has a sensitivity 100 times higher than the RCA IP 21. Author (ESA)

N82-10868# Engins Matra, Velizy (France).
FIBER OPTICS [FIBRES OPTIQUES]
E. Gellee 24 Nov. 1980 87 p refs In FRENCH
Avail: NTIS HC A05/MF A01

Technological progress in the domain of optical transmission, specifically via fiber optical cables, was reviewed. The different types of fibers are discussed, and the principle of luminous propagation in fibers is explained. Attenuation in optical fibers is considered and the various causes of losses are listed. Insertion losses are then dealt with and methods of connecting fiber optic cables are summarized. Factors affecting the choice of a fiber optic transmission system were also surveyed. In conclusion, several military applications are cited. Author (ESA)

N82-10869# Agfa-Gevaert A.G., Munich (West Germany). Camera-Werk.
APPLICATION OF REFRACTIVE OPTICAL MICROSTRUCTURES Final Report
Reinhold Deml Bonn Bundesministerium fuer Forschung und Technologie Nov. 1980 118 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-80-106; ISSN-0340-7608) Avail: NTIS HC A06/MF A01; Fachinformationzsentrum, Karlsruhe, West Germany DM 24.80

Photographic and photochemical production methods are presented with special applications. In the framework of the investigation of light-sensitive relief materials, several chromate-gelatin processes and a positive photoresistive process were examined in detail. Periodic microstructures in the range from 0.01 to 1mm, showing acceptable surface quality as well as profile tolerances of about 0.2 micron are obtained. Various

lenticular arrays, a lenticular system for 1/1 copying, and a contrast enhancing lenticular projection screen are produced. The procedure offers the possibility of generating grating, Fresnel and lenticular profiles of almost arbitrary shape, showing precision and quality of surface which can in general not be obtained by means of the existing methods. Author (ESA)

N82-10870# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Space Div.
STUDY ON THE ELECTRONIC IMAGING SYSTEM MOMS IN THE REFLECTED AND THERMAL INFRARED SPECTRUM Final Report
Bernd Kunkel Bonn Bundesministerium fuer Forschung und Technologie Sep. 1980 105 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-80-026; MBB-R-3700/2129-R; ISSN-0170-1339) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 22,10

The modular opto-electronic multispectral scanner (MOMS) system is discussed. It has a separate module per spectral range for visible and near infrared radiation (NIR). The extension of the MOMS system into the reflected infrared (IR) and thermal IR spectral ranges are dealt with. Main emphasis is on the technical realization possibilities and concepts for the linear IR detector arrays, the optics, and the signal readout electronics. Technical solutions were investigated in detail, aiming at a spaceborne scanner system in connection with the visible/NIR MOMS modules, and a thermal IR breadboard is described. Author (ESA)

N82-10871 Arizona Univ., Tucson.
AN INVESTIGATION OF COMPUTER-ASSISTED STRAY RADIATION ANALYSIS PROGRAMS Ph.D. Thesis
Janet Sue Fender 1981 195 p
Avail: Univ. Microfilms Order No. 8117741

The capabilities and limitations of computer assisted stray radiation analysis programs are evaluated. Arizona's Paraxial Analysis of Radiation Transfer (APART) and Honeywell's General Unwanted Energy Rejection Analysis Program (GUERAP III) were examined to identify major assumptions and approximations, to gauge any resulting errors, and to devise possible remedies to extend the accuracy and capabilities of each program. One important vehicle for comparison was the spray light analysis of a heat seeking missile. Both APART and GUERAP III were used to analyze the same opto-mechanical catadioptric system. APART was then used as a tool for design modifications that resulted in predicted performance improvements of four orders of magnitude. Performance measurements were not available to verify predictions. Dissert. Abstr.

N82-10872# Arizona Univ., Tucson.
NEW METHODS OF NONLINEAR DIGITAL IMAGE RESTORATION Ph.D. Thesis
Eric Grant Hawman 1981 200 p
Avail: Univ. Microfilms Order No. 8118458

Four methods for image restoration are developed and presented. The object estimates have a nonlinear dependence on the image data and iterative methods of solution are needed. The restoration algorithms are compared with previously developed methods by means of computer simulations. The problem of restoring noisy images where the spread function is known is regarded as a constrained least squares optimization problem and methods for enforcing upper and lower bounds on the restoration are considered. A statistical approach to the known spread function restoration problem based on maximum entropy methods allows the synthesis of estimators to comply with various prior constraints the image restorer wishes to impose. In restoration of atmospherically degraded images, in addition to random noise in the image, one is faced with a randomly changing spread function. Two algorithms for restoration having high noise immunity are proposed. Dissert. Abstr.

N82-11004# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
COLOR DISCRIMINATION BY A COLOR-PICTURE READER
Chen Chenghang *In its* Recent Selected Papers of NW Polytech. Univ., pt. 2 (FTD-ID(RS)T-0260-81-Pt-2) 28 Aug. 1981 p 253-272 refs Transl. into ENGLISH from Recent Selected Papers of NW Polytech. Univ., pt. 2 (Xian Shaanxi), 1979 (For primary document see N82-10996 01-99)
Avail: NTIS HC A18/MF A01

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion. For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N82-10873 Illinois Univ. at Urbana-Champaign.
AN ENERGY-DEPENDENT FINITE-ORBIT TREATMENT FOR PLASMA BUILDUP IN MIRROR FUSION DEVICES Ph.D. Thesis
Mark Mundy Campbell 1981 159 p
Avail: Univ. Microfilms Order No. 8114396

A computer simulation of hot plasma buildup in mirror fusion devices and results from this model are presented. Finite gyro-radius effects are treated by a dynamic model called FOREMD (finite orbit, radial, energy and magnetic-field dependent). The model includes a quasi-liner treatment for the drift cyclotron loss cone instability. Also included are effects of the local magnetic-field on ion orbits. The model was used to study plasma buildup (particularly early states) in presently operating and proposed mirror devices (2XII-B, TMX, FERF) and in the twin beam mirror. Results of these simulatons compared to experiments or design expectations are presented. General factors in plasma buildup and their relative importance are also examined with recommendations on how to achieve plasma buildup under c-x erosion conditions with minimal injected beam power. Dissert. Abstr.

N82-10874 Wisconsin Univ. - Madison.
PLASMA TRANSPORT IN A SIMULATED MAGNETIC DIVERTOR CONFIGURATION Ph.D. Thesis
Clifford Mark Strawitch 1981 210 p
Avail: Univ. Microfilms Order No. 8116021

The transport properties of plasma on magnetic field lines that intersect a conducting plate were studied experimentally in an internal rind D.C. machine to simulate certain aspects of plasma phenomena that may take place in a Tokamak divertor. It was found by a variety of measurements that the cross field transport is non-ambipolar and that although the nonambipolarity may be reduced, it is difficult to eliminate entirely. The plasma flow velocity parallel to the magnetic field is found to be near the ion acoustic velocity in all cases. The experimental density and electron temperature profiles are compared to the solutions to a one dimensional transport model that is model that is commonly used in divertor theory. Solutions to both the steady state density, and time dependent coupled density and temperature equations of this model, agree well with the experimental profiles, for cross field coefficients that scale like the classical coefficients due to ion-neutral collisons, cross field conductivities that scale like the classical conductivities due to ion-neutral collisions, cross field conductivities that scale like the classical conductivities due to electron-neutral collisions, and parallel loss terms that scale like the ion acoustic velocity. Dissert. Abstr.

N82-10875 Texas Univ. at Arlington.
CHARACTERISTICS OF LOW FREQUENCY MHD FLUCTUATIONS IN THE PRETEXT TOKAMAK Ph.D. Thesis
Thaddeus Paul Kochanski 1981 193 p
Avail: Univ. Microfilms Order No. 8119320

The temporal an spectral characteristics of low frequency (< 100 KHz) MHD fluctuations, which are commonly associated with disruptions, were investigated. There exists rigid phase coherence between the internal m = 1, and externally detected m = 2 modes indicative of strong mode coupling. A parametric study of the frequency of the mode, in the saturated state, indicates that the frequency scales with the toroidal magnetic field, and is inversely proportional to the plasma current. The frequency was observed to decrease abruptly as the mode amplitude rapidly increases prior to a plasma disruption. The burst type growth of the m = 2 mode appears to be inextricably

linked to the occurrence of the distruptive instability.
Dissert. Abstr.

N82-10876 California Univ., Davis.
GYROELASTIC FLUIDS Ph.D. Thesis
Gary Dean Kerbel 1981 131 p
Avail: Univ. Microfilms Order No. 81/7571

A simple scale model in three dimensions of a guiding center plasma is studied within the purview of gyroelastic (also known as finite-gyro-radius or finite-angular-momentum-density) magnetohydrodynamics. The (nonlinear) system sustains a particular symmetry called isorrhopy as a result of which drift oscillations and fluid oscillations are decoupled. Isorrhopic equilibria are analyzed first within the framework of geometrical optics, resulting in (local) dispersion relations and ray constants. A general scheme is then developed to evolve an arbitrary linear perturbation of a screwpinch equilibrium as an invertible integral transform (over the complete set of generalized eigenfunctions defined naturally by the equilibrium.) Details of the structure of the function space and the associated spectra are elucidated. Features of the (global) dispersion relation owing to the presence of gyroelastic stabilization are revealed. An energy principle is developed and applied to study the stability of the tubular screwpinch.
Dissert. Abstr.

N82-10877 Polytechnic Inst. of New York, Brooklyn.
PROPAGATION AND NONLINEAR STUDIES OF ELECTROMAGNETIC WAVES IN A SELFSUSTAINED PLASMA BEAM Ph.D. Thesis
Hao-Ming Huang 1981 122 p
Avail: Univ. Microfilms Order No. 8118875

The electrostatic ion-cyclotron wave was excited parametrically with the second harmonic electron-cyclotron wave by injecting a monochromatic electromagnetic wave. The generation of the second and of the third harmonic waves was clearly observed on the spectrum analyser. The evolution process of suppression of the second harmonic and enhancement of the third harmonic wave was studied by varying a d.c. voltage from zero value on the probe that is used to pick up the signal. The rate equations for the second and the third harmonics was obtained and coupling coefficients were calculated by using the Vlasov equation. By adjusting the operating parameters of the device, two distinct modes of plasma column were obtained. The microwave intensity is maximum at the center of the column for the second mode. A theoretical model is proposed in which the plasma is considered as cylindrical dielectric wave medium situated in a longitudinally applied d.c. magnetic field. Full Maxwell's equations are used examine the problem instead of the usual simplified electrostatic approximation.
Dissert. Abstr.

N82-10878 California Univ., Riverside.
A SEARCH FOR SLOW MODE SHOCKS IN THE DOUBLE INVERSE PINCH DEVICE Ph.D. Thesis
George William Kamin 1981 250 p
Avail: Univ. Microfilms Order No. 8119571

This study of a simulated solar flare mechanism reports the results of experiments designed to replicate the original findings in the double inverse pinch device (DIPD). It was proposed that the Petschek energy release mechanism of solar flares was accurately simulated in the device. This search for shock structures was conducted in a close replica of the original DIPD and for the same plasma parameters. No separated shocks were found, only a single current sheet along the contact region between the inverse pinches was seen. Furthermore, measurements of bulk flow velocities cast significant doubt on the applicability of using the Petschek mechanism to describe the flow field in the DIPD.
Dissert. Abstr.

N82-10879 Texas Univ. at Arlington.
THE ION THERMAL CONDUCTIVITY FOR A PURE TOKAMAK PLASMA Ph.D. Thesis
Curtis Willaim Bolton, III 1981 118 p
Avail: Univ. Microfilms Order No. 8119263

The ion thermal conductivity was calculated for a wide range of aspect ratios and collision frequencies by solving the drift kinetic equation, with a model collision operator, using a finite element method, and then calculating the energy weighted friction force to determine the heat flux. The thermal conductivity, determined from the heat flux was then curve fitted to analytic formulas. These formulas allow the conductivity to be calculated at all collision frequencies and aspect ratios down to about 3. The two main results of these calculations are, first, energy scattering increases the thermal conductivity, over values previously calculated, by a factor on the order of 1.5-2 and second, the Pfirsch-Schluter contribution becomes significant at low collision frequencies, when the aspect ratio is small. Comparisons of the thermal conductivity with the results of previous authors are given. The distribution function for various collision frequencies, aspect ratios and collision operators is included.
Dissert. Abstr.

N82-10880*# Colorado State Univ., Fort Collins. Dept. of Physics.
EXPERIMENTAL SIMULATION OF BIASED SOLAR ARRAYS WITH THE SPACE PLASMA Annual Report
Harold R. Kaufman and Raymond S. Robinson May 1981 71 p refs
(Grant NsG-3196)
(NASA-CR-165485) Avail: NTIS HC A04/MF A01 CSCL 20I

The phenomenon of unexpectedly large leakage currents collected by small exposed areas of high voltage solar arrays operating in a plasma environment was investigated. Polyimide (Kapton) was the insulating material used in all tests. Both positive bias (electron collection) and negative bias (ion collection) tests were performed. A mode change in the electron collection mechanism was associated with a glow discharge process and was found to be related to the neutral background density. Results indicate that the glow discharge collection mode does not occur in a space environment where the background density is considerably lower than that of the vacuum facility used. B.W.

N82-10881# JAYCOR, San Diego, Calif.
ANALYTICAL INVESTIGATION OF EMITTING PROBES IN AN IONIZED PLASMA
R. E. Leadon, A. J. Woods, E. P. Wenaas, and H. H. Klein 12 Apr. 1981 78 p refs
(Contract F19628-79-C-0121; AF Proj. 7601)
(AD-A104166; JAYCOR-J200-80-250A/2172; AFGL-TR-81-0138) Avail: NTIS HC A05/MF A01 CSCL 20/3

Analytical and computer model studies have been made of the electrostatic potentials achieved by electron- and ion-emitting atmospheric probes. The variables that were considered include the beam species, their energy and current, the density and temperature of the ambient plasma, ionization of the neutral atmosphere by the plasma electrons which supply the replacement current for electron-emitting probes, and the effects of the geomagnetic field on trajectories of the charged particles. Mean ionization distances as large as 100 meters have a pronounced effect on the potentials of electron-emitting probes for beam currents greater than 0.01 amperes. The calculations indicate a peak in the I-V curve for such probes.
Author (GRA)

N82-10882# Massachusetts Inst. of Tech., Cambridge. Energy Lab.
KEY CONTRIBUTIONS IN MHD POWER GENERATION Quarterly Technical Progress Report, 1 Mar. - 31 May 1980
J. F. Louis May 1981 162 p refs
(Contract DE-AC01-79ET-15518)
(DE81-028121; DOE/ET-15518/5) Avail: NTIS HC A08/MF A01

Progress is reported in (1) investigating electrical behavior in the vicinity of electrode and insulating walls; (2) studying critical performance issues in the development of combustion disk generators; (3) developing and testing electrode modules (including studies of insulator properties); (4) determining coal combustion kinetics and ash behavior relevant to two-stage MHD combustors, and (5) investigating the mixing and flow aerodynamics of a high swirl geometry second stage.
DOE

N82-10883# Texas Univ., Austin. Inst. for Fusion Studies.
DYNAMIC MAGNETIC X-POINTS
J. N. Leboeuf, (Calif. Univ., Los Angeles), T. Tajima, and J. M. Dawson, (Calif. Univ., Los Angeles) Mar. 1981 63 p refs
(Contracts DE-FG05-80ET-53088;

DE-AM03-7650-0010-PA-26; Grants NSF PHY-79-01319; NSF ATM-79-26492)
(DE81-029830; DOE/ET-53088/15; IFSR-15) Avail: NTIS HC A04/MF A01

Two and one half dimensional magnetostatic and electromagnetic particle simulations of time varying magnetic x-points and the associated plasma response are reported. The stability and topology depends on the crossing angle of the field lines at the x-point, irrespective of the plasma. It is stipulated that the electrostatic field and finite Larmor radius effects are important in current penetration and shaping of the plasma flow. The snapping of the field lines, and dragging of the plasma into, and confinement of the plasma at, an o-point is observed. Magnetic island coalescence with explosive growth of the coalescence mode occurs and is accompanied by a large increase of kinetic energy and temperature as well as the formation of hot tails on the distribution functions. DOE

N82-10884# Texas Univ. at Austin. Fusion Research Center.
INVESTIGATION OF RUNAWAY ELECTRONS IN THE PRETEXT TOKAMAK Ph.D. Thesis
Stephen Alan Eckstrand Jan. 1981 120 p refs
(Contract DE-AS05-77ET-53042)
(DE81-029984; DOE/ET-53042/24) Avail: NTIS HC A06/MF A01

High energy (0.2 to 0.4 MeV) runaway electrons were studied in PRETEXT discharges by detecting the hard X-ray bremsstrahlung radiation produced when they escape from the discharge and strike the limiter. A pulse height analysis system, which included pileup rejection circuitry because of the high count rate, recorded both the amplitude and arrival time of each pulse. DOE

N82-10885# Texas Univ. at Austin. Fusion Research Center.
CHARACTERISTICS OF LOW FREQUENCY MHD FLUCTUATIONS IN THE PRETEXT TOKAMAK
Thaddeus Paul Kochanski May 1981 191 p refs
(Contract DE-AC05-76ET-53036)
(DE81-029720; DOE/ET-53036/27) Avail: NTIS HC A09/MF A01

The temporal and spectral characteritics of low frequency MHD fluctuations, commonly associated with disruptions, were investigated in the PRETEXT Tokamak. Rigid phase coherence between the internal m = 1, and externally detected m = 2 modes indicative of strong mode coupling was noted. The frequency of the mode, in the saturated state, indicates frequency scaling with the toroidal magnetic field, and is inversely proportional to the plasma current. The frequency is observed to decrease abruptly as the mode amplitude rapidly increases prior to a plasma disruption. The burst type growth of the m = 2 linked to the occurence of the disruptive instabilty. DOE

N82-10886# Los Alamos Scientific Lab., N. Mex.
POWER-CROWBAR IMPACTS ON PLASMA CHARACTERISTICS IN ZT-40
R. G. Watt Jul. 1981 8 p refs
(Contract W-7405-eng-36)
(DE81-027935; LA-8914-MS) Avail: NTIS HC A02/MF A01

The impact of I/sub phi/ and I/sub theta/ power crowbars on the Zt-40 plasma is presented. It is demonstrated that in both aided and self reversed modes the main effect of the I/sub phi/ power crowbar is to lengthen the time to I/e of peak current, whereas the main effect of the I/sub theta/ power crowbar is to extend the reversal of B/sub phi/ at the wall, primarily in self reversed operation. It is shown that this extension has the effect of also decreasing the current decay rate to the point where no distinction is seen between the two modes. A saturation is seen in the decay time (tau/sub 1/e less than or equal to 0.4 ms) once the field reversal in either mode exceeds approximately 0.3 ms. DOE

N82-10887# Argonne National Lab., Ill.
FIRST-WALL/BLANKET MATERIALS SELECTION FOR STARFIRE TOKAMAK REACTOR
D. Smith, R. F. Mattas, R. G. Clemmer, and J. W. Davis (McDonnell Douglas Astronautics Co., St. Louis) 1980 22 p refs Presented at the 4th Am. Nucl. Soc. Topical Meeting on the Technol. of Controlled Nucl. Fusion, King of Prussia, Pa., 14-17 Oct. 1980
(Contract W-31-109-eng-38)
(DE81-023915; CONF-801011-95) Avail: NTIS HC A02/MF A01

The major parameters and properties that impact materials selection and design criteria for the development of the reference first-wall/blanket design of a Tokamak reactor are reviewed. Tradeoffs in the materials selection process for the breeding material, coolant structure, neutron multiplier, and reflector are detailed. DOE

N82-10888# TRW Defense and Space Systems Group, Redondo Beach, Calif. Combustion and Power Technology Dept.
HIGH PRESSURE MHD COAL COMBUSTORS INVESTIGATION, PHASE 2 Final Technical Report
H. Iwata and R. Hamberg May 1981 129 p
(Contract DE-AC22-78ET-11053)
(DE81-027238; DOE/ET-11053/T1; FE-2706-43) Avail: NTIS HC A07/MF A01

A high pressure MHD coal combustor was investigated. The purpose was to acquire basic design and support engineering data through systematic combustion experiments at the 10 and 20 thermal megawatt size and to design a 50 MW/sub t/ combustor. This combustor is to produce an electrically conductive plasma generated by the direct combustion of pulverized coal with hot oxygen enriched vitiated air that is seeded with potassium carbonate. Vitiated air and oxygen are used as the oxidizer, however, preheated air will ultimately be used as the oxidizer in coal fired MHD combustors. DOE

N82-10889# Argonne National Lab., Ill.
LOWER-HYBRID HEATING AND CURRENT DRIVE SYSTEM FOR THE STARFIRE TOKAMAK
D. A. Ehst, C. D. Boley, K. Evans, Jr., R. Fuja, J. Jung, C. A. Trachsel (McDonnell Douglas Astronautics Co., St Louis), and T. Hino (General Atomic Co., San Diego, Calif.) 1980 9 p refs Presented at the 4th ANS Topical Meeting on the Technol. of Controlled Nucl. Fusion, King of Prussia, Pa., 14-17 Oct. 1980
(Contract W-31-109-eng-38)
(DE81-023845; CONF-801011-97) Avail: NTIS HC A02/MF A01

Starfire is a commercial Tokamak reactor which is designed to operate in a purely steady-state mode with the electron current maintained by momentum transfer from lower-hybrid waves launched from end-fire waveguide arrays. The RF system was designed for consistency with plasma physics constraints, and its components have been selected with the goal of minimizing the electric power required to maintain the plasma current. The system was analyzed in the thermal, electrical, magnetic, and radiative environments of reactor operation and appears to provide reliable, low-maintenance performance. DOE

N82-10890# Argonne National Lab., Ill.
CHOICE OF COOLANT IN COMMERCIAL TOKAMAK POWER PLANTS
Mohamed A. Abdou and D. Graumann 1980 9 p refs Presented at the 4th Am. Nucl. Soc. Topical Meeting on the Technol. of Controlled Nucl. Fusion, King of Prussia, Pa., 14-17 Oct. 1980
(Contract W-31-109-eng-38)
(DE81-023716; CONF-801011-87) Avail: NTIS HC A02/MF A01

Two coolants, water and helium, were compared and the advantages of pressurized water for the conditions of the STARFIRE Tokamak power plant design are shown. The STARFIRE design focuses on solid tritium breeder blankets to minimize the stored chemical energy. It is suggested that the most suitable coolant with solid tritium breeders are water and helium. The areas where development is required to utilize the potential advantages of helium are identified. DOE

N82-10891# Argonne National Lab., Ill.
STARFIRE BURN CYCLE
Jeffrey N. Brooks, Charles D. Boley, and Daniel Driemeyer 1980 9 p refs Presented at the 4th Am. Nucl. Soc. Topical Meeting on the Technol. of Controlled Nucl. Fusion, King of Prussia, Pa., 14-17 Oct. 1980
(Contract W-31-109-eng-38)
(DE81-023708; CONF-801011-89) Avail: NTIS HC A02/MF A01

The STARFIRE burn cycle from pulsed reactor burn cycles

were examined. The startup and shutdown periods are considerably longer, and the power supply requirements considerably smaller, than for pulsed operation. Plasma initiation is accomplished with electron cyclotron resonance heating to eliminate the problems of high voltage coils. During the main burn the plasma is thermally stabilized by the addition of trace quantities of iodine, which serve to radiate most of the alpha heating energy. The burn cycle is compatible with lower hybrid current drive operation. DOE

N82-10892# Argonne National Lab., Ill.
ELECTROMAGNETIC EFFECTS INVOLVING A TOKAMAK REACTOR FIRST WALL AND BLANKET
L. Turner, K. Evans, Jr., E. Gelbard, and R. Prater 1980 12 p refs Presented at the 4th Am. Nucl. Soc. Topical Meeting on the Technol. of Controlled Nucl. Fusion, King of Prussia, Pa., 14-17 Oct. 1980
(Contract W-31-109-eng-38)
(DE81-023719; CONF-801011-91) Avail: NTIS HC A02/MF A01

Four electromagnetic effects experienced by the first wall and blanket of a Tokamak reactor are considered. The first wall provides reduction of the growth rate of vertical axisymmetric instability and stabilization of low mode number interval kink modes. If a rapid plasma disruption occurs, a current will be induced on the first wall, tending to maintain the field formerly produced by the plasma. Correction of plasma movement can begin o a time scale much faster than the L/R time of the first wall and blanket. Field changes, especially those from plasma disruption or from rapid discharge of a toroidal field coil, can cause substantial eddy current forces on elements of the first wall and blanket. DOE

N82-10893# Argonne National Lab., Ill.
DEVELOPMENT OF TRITIUM BREEDING BLANKETS FOR DT BURNING FUSION REACTORS
R. G. Clemmer 1980 11 p refs Presented at the 4th Am. Nucl. Soc. Topical Meeting on the Technol. of Controlled Nucl. Fusion, King of Prussia, Pa., 14-17 Oct. 1980
(Contract W-31-109-eng-38)
(DE81-023904; CONF-801011-92) Avail: NTIS HC A02/MF A01

Blanket tritium recovery and the performance of potentially viable tritium breeding materials under conditions anticipated in a DT fueled fusion reactor environment was studied. The existing physicochemical, thermophysical, and ceramographic data for candidate liquid and solid breeders are reviewed and appropriate operating conditions defined. It is shown that selection of a breeding material and an appropriate tritium recovery method can impose significant constraints upon blanket design, particularly when considerations of breeder/coolant/structure compatibility and temperature limitations are taken into account. DOE

N82-10894# Argonne National Lab., Ill.
IMPLICATIONS OF THE DD FUEL CYCLE ON TOKAMAK REACTOR TECHNOLOGY CONSIDERATION
C. C. Baker, J. N. Brooks, D. A. Ehst, K. Evans, Jr., J. Jung, R. Mattas, B. Misra, D. L. Smith, H. Stevens, and L. R. Turner 1980 14 p refs Presented at the 4th ANS Topical Meeting on the Technol. of Controlled Nucl. Fusion, King of Prussia, Pa., 14-17 Oct. 1980
(Contract W-31-109-eng-38)
(DE81-023712; CONF-801011-93) Avail: NTIS HC A02/MF A01

The initial results of a study to develop a conceptual design of a DD Tokamak reactor are reported. A comprehensive steady-state power and particle balance code was used to survey a variety of design points. A reference set of parameters was selected for further study. The concepts of RF driven currents and a limiter-vacuum system were examined and appear to offer promise. DOE

N82-10895# Argonne National Lab., Ill.
OVERVIEW OF THE STARFIRE REFERENCE COMMERCIAL TOKAMAK FUSION POWER REACTOR DESIGN
C. C. Baker, M. A. Abdou, D. A. DeFreece (McDonnell Douglas Astronautics Co., St. Louis), C. A. Trachsel (McDonnell Douglas Astronautics Co., St. Louis), D. Graumann (General Atomic Co.), and K. Barry (Ralph M. Parsons Co.) 1980 16 p refs Presented at the 4th Am. Nucl. Soc. Topical Meeting on the Technol. of Controlled Nucl. Fusion, King of Prussia, Pa., 14-17 Oct. 1980
(Contract W-31-109-eng-38)
(DE81-203912; CONF-801011-94) Avail: NTIS HC A02/MF A01

A design concept for a commercial Tokamak fusion electric power plant based on the deuterium/tritium/lithium fuel cycle is discussed. The major features include a steady-state operating mode based on a continuous RF lower-hybrid current drive and auxiliary heating, solid tritium breeder material, pressurized water cooling, limiter/vacuum system for impurity control and exhaust, high tritium burnup, superconducting poloidal coils outside the toroidal field superconducting coils, fully remote maintenance, and a low-activation shield. DOE

N82-10896# Argonne National Lab., Ill.
LIMITER/VACUUM SYSTEM FOR PLASMA IMPURITY CONTROL AND EXHAUST IN TOKAMAKS
M. A. Abdou, J. N. Brooks, R. Mattas, R. G. Clemmer, P. Finn, D. Smith, B. Misra, H. Schreyer, H. Stevens, and L. Turner 1980 11 p refs Presented at the 4th ANS Topical Meeting on the Technol. of Controlled Nucl. Fusion, King of Prussia, Pa., 14-17 Oct. 1980 Prepared in cooperation with McDonnell Douglas Astronautics Co., St. Louis,
(Contract W-31-109-eng-38)
(DE81-023843; CONF-801011-96) Avail: NTIS HC A02/MF A01

It is shown that the limiter/vacuum concept is a very attractive option for power reactors. It is relatively simple and inexpensive and deserves serious experimental verification. DOE

N82-10897# Argonne National Lab., Ill.
FIRST-WALL, BLANKET, AND SHIELD ENGINEERING TEST PROGRAM FOR MAGNETICALLY CONFINED FUSION POWER REACTORS
Victor A. Maroni 1980 15 p refs Presented at the 4th Am. Nucl. Soc. Topical Meeting on the Technol. of Controlled Nucl. Fusion, King of Prussia, Pa., 14-17 Oct. 1980
(Contract W-31-109-eng-38)
(DE81-023911; CONF-801011-100) Avail: NTIS HC A02/MF A01

First wall blanket and shield (FW/B/S) system thermal-hydraulics, thermomechanics, nucleonics, electromagnetic, assembly, maintenance, and repair are identified. Planning exercises that: indicated (1) meaningful near term engineering testing should be feasible within the bounds of a modest funding base; (2) there are existing facilities and expertise which can be profitably utilized in this testing; and (3) near term efforts should focus on the measurement of engineering data and the verification/calibration of predictive methods for anticipated normal operational and transient FW/B/S conditions. The planning strategies, approach to near term testing, and longer range needs for integrated FW/BS/ test facilities are also discussed. DOE

N82-10898# Argonne National Lab., Ill.
SAFETY OF SUPERCONDUCTING MAGNETS FOR FUSION: THERMAL AND ELECTROMAGNETIC EFFECTS OF RAPID TF COIL DISCHARGE
Larry R. Turner 1980 9 p refs Presented at the 4th Am. Nucl. Soc. Topical Meeting on Technol. of Controlled Nucl. Fusion, King of Prussia, Pa., 14-17 Oct. 1980
(Contracts W-31-109-eng-38; DE-AC07-76ID-01570)
(DE81-203844; CONF-801011-103) Avail: NTIS HC A02/MF A01

The consequences of a sudden voltage damp of 20 kV (0.83 omega for a 24 kA current) in a magnet system of a Tokamak device were investigated. DOE

N82-10899# Union Carbide Corp., Oak Ridge, Tenn. Nuclear Div.
QUALITY-ASSURANCE APPROACH FOR THE ELMO BUMPY TORUS PROOF-OF-PRINCIPAL EXPERIMENT
F. M. Sticksel 1981 16 p Presented at the IEA Tokamak Quality Assurance Workshop, Princeton, N.J., 2 Jun. 1981
(Contract W-7405-eng-26)
(DE81-023224; CONF-810654-2) Avail: NTIS HC A02/MF A01

A brief description of the Elmo Bumpy Torus of Principle (EPT-P) is given highlighting various components. Development of a quality control program to assure that the design, development, and implementation of effective quality requirements for the EBT-P are met is outlined. Aspects of this program discussed include: receiving inspection, fabrication control, final inspection and test, nonconformance control, shipping inspection, and surveillance during installation and testing. S.L.

N82-10900# Sandia Labs., Albuquerque, N. Mex.
UV-LASER-TRIGGERED SWITCHES
J. R. Woodworth, C. A. Frost, and T. A. Green 1981 13 p refs Presented at the 3rd IEEE Intern. Pulsed Power Conf., Albuquerque, N. Mex., 1 Jun. 1981
(Contract DE-AC04-76DP-00789)
(DE81-769486; SAND-81-0695C; CONF-810659-1) Avail: NTIS HC A02/MF A01

Two techniques of UV laser triggering for high voltage spark gaps were developed in which a KrF laser (248nm) is used to create an ionized channel through the dielectric gas in the spark gap. Laser induced breakdown in SF6 was studied and this phenomenon was applied to trigger a 0.5MV spark gap. The use of additives to the usual dielectric gas, such as Tripropylamine, which undergo 2-step ionization in a KrF laser field, is studied. They allow nanosecond-jitter laser triggering even with the use of a relatively low optical quality beam. Data are presented for a 0.5 MV pulse charged switch triggered with a low divergence KrF laser at 80% of its self-breakdown voltage which demonstrate a 1-sigma jitter of 150 ps. DOE

N82-10901# Los Alamos Scientific Lab., N. Mex.
INFLUENCES ON TARGET IRRADIATION SYMMETRY IN CO2 LASER-FUSION EXPERIMENTS
R. L. Carman 1981 28 p refs Presented at the Topical Conf. on Symmetry Aspects of Inertial Fusion Implosions, Washington, D.C., 27 May 1981
(Contract W-7405-eng-36)
(LA-UR-81-1566; CONF-810576-1) Avail: NTIS HC A03/MF A01

The presence of CO2 laser deposits its energy of very steep density profiles and high upper shelf densities the CO2 laser deposits its energy spatially quite close to the ablation surface. Calculations indicate that a high degree of symmetry exist to achieve the necessary high compression ratios. Energy transport provides only limited improvement in the ablative symmetry over that achieved in the irradiation symmetry. It is suggested that a balance between radiation pressure and hydrodynamic pressure underestimates the density to which the CO2 laser light penetrates for early times. DOE

N82-10902# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics and Fusion Research.
ON KINK STABILIZATION BY VIOLATION OF THE SECOND ADIABATIC INVARIANT Research and Training Programme on Controlled Thermonuclear Fusion and Plasma Research (EUR-NE)
B. Lehnert Dec. 1980 17 p refs
(TRITA-PFU-80-11; ISSN-0348-7644) Avail: NTIS HC A02/MF A01

An attempt is made to determine the nonadiabatic effects arising from the violation of the constancy of the second adiabatic invariant. The major focus is on the case of a plane kink disturbance of a cylindrical plasma column. It is shown that nonadiabatic ion motion arise at small and intermediate wave lengths from the changes in curvature of the drift surface. R.C.T.

N82-10903 California Univ., Irvine.
PLASMA MOTION ACROSS A MAGNETIC FIELD Ph.D. Thesis
William Kalman Peter 1981 191 p
Avail: Univ. Microfilms Order No. 8118488

The possibility of injecting pulsed, neutralized, ion beams into toroidal fields for the purpose of driving currents or of supplementary Tokamak heating was assessed. Cross field injection experiments are divided into two categories: those in which the beam radius R is much greater than in ion gyroradius a sub i, and those in which R >> a sub i. Condition one is usually applicable to beams injected from plasma guns while condition two is usually applicable to high energy neutralized ion beams injected from ion diodes. Dissert. Abstr.

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers*.

N82-10904 Princeton Univ., N. J.
AUGER INVESTIGATION OF ANNEALING PROCESSES IN MOS TECHNOLOGY Ph.D. Thesis
Steven Robert Jost 1981 65 p
Avail: Univ. Microfilms Order No. 8118666

Thin oxides of SiO2 on clean Si surfaces were studied by Auger electron spectroscopy to determine the effects of various annealing processes on the Si/SiO2 interface. A defect peak was observed in the Auger spectrum near 83 eV that is theoretically associated with dangling Si bonds at the interface which are caused by lattice mismatch between Si and SiO2. Exposure to hydrogen significantly reduced the magnitude of this Auger peak which corresponds to the reduction in interface-state density in MOS structures following a low temperature forming gas anneal. Subsequent heat treatment in ultrahigh vacuum resulted in the return of the defect peak in the spectrum showing the reversibility of the role of hydrogen in interface state passivation. Nitrogen, argon, and vacuum high temperature anneals were also investigated, and it was found that nitrogen anneals seem to be more effective in the reduction of interface-state density, although a mechanism for its effectiveness could not be determined. Dissert. Abstr.

N82-10905 Colorado State Univ., Fort Collins.
PHOTOELECTRON SPECTROSCOPY AND INITIAL OXIDATION OF ION DISORDERED SILICON Ph.D. Thesis
Daniel Lloyd Ellsworth 1981 204 p
Avail: Univ. Microfilms Order No. 8119699

The physical and chemical properties of the silicon surface disordered by ion bombardment are described. The unique properties of this surface are exploited by UPS valence band studies of oxygen adsorption to reveal the presence of substrate structure dependent oxygen bonding. An extended surface model is proposed for the structure of the surface. Quantitative oxygen adsorption kinetics studies are presented in terms of oxygen silicon bond formation rate, as well as total presence of oxygen. Correlation of these results with observations for valence band photoemission density of states signatures has provided data which are interpreted in terms of the details of initial oxygen silicon bond formation. Disordered surface experiments are discussed in terms of results for adsorption on cleaved surfaces. In characterizing various applications of ion beam sputtering, a simple, quantitative time dependent mixing model is suggested as an explanation for changes which occur in Si/SiO2 interfaces core level spectra with increasing ion dose. Dissert. Abstr.

N82-10906 Pennsylvania Univ., Philadelphia.
MECHANISMS OF FATIGUE DEFORMATION AND FAILURE IN COPPER SINGLE CRYSTALS Ph.D. Thesis
Alex Sinn-Jeng Cheng 1981 225 p
Avail: Univ. Microfilms Order No. 8117768

In low-strain fatigue, an initially annealed metal hardens rapidly by accumulating dislocation structures. These consist of patches of dislocation dipolar loops in edge orientation separated by channels relatively free of dislocation debris. The plastic strain is carried both by crew dislocations gliding in the channels between loop patches and by the loop patches themselves, deforming by flip-flop motions of the dipoles. Two factors, applied strain amplitude and crystal orientation, which strongly affect rapid hardening, were explored by constant strain amplitude tests on single crystals. In general, a higher strain amplitude and a higher ratio of stress on the secondary system to that on the primary system act to increase the back stress and the friction stress in the specimen so the resultant cyclic flow stress is higher at a given cumulative strain, but only during rapid hardening. These results are discussed in terms of Kuhlmann-Wilsdorf's theory of rapid hardening. Dissert. Abstr.

N82-10907 State Univ. of New York at Albany.
DEFECTS IN SEMICONDUCTORS Ph.D. Thesis
James Peter Karins, Jr. 1981 212 p
Avail: Univ. Microfilms Order No. 8118750

Stable configurations of several defects to silicon were obtained using molecular mechanics, a theoretical technique in organic chemistry. Major modifications of the technique were necessary and a set of semiempirical parameters for silicon clusters with and without oxygen impurities was obtained. Calculations of the split - < 100 > interstitial yielded a stable configuration in agreement with previously speculated structures. Calculations of vacancies, divacancies, trivacancies and tetravacancies in different bonding configurations compared extremely well with experimental structures. Molecular mechanics structures of the oxygen interstitial and oxygen vacancy pair agreed quantitatively with experimental results. At the present molecular mechanics is the only practical and accurate technique to determine semiconductor defect structures. Dissert. Abstr.

N82-10908 State Univ. of New York at Stony Brook.
STUDIES OF EXACTLY SOLVABLE SPIN SYSTEMS Ph.D. Thesis
Mahalingam Mohan 1981 67 p
Avail: Univ. Microfilms Order No. 8119238

The long time behavior of transverse spin self-correlations is studied in the one dimensional XY model for two special sets of values of the coupling constants. A summation of leading long-time divergences is made at finite temperatues. This leading order result is compared with long time behavior of self correlations predicted by some approximate theories, as well as with experimental data on one dimensional systems. The form of the n-point Green's functions of two dimensional Ising field theory (for the case when the critical temperature is approached from below) is used to obtain the connected three-point Green's function for large separations in the presence of a magnetic field, by a procedure of formal summation. It is demonstrated nontrivially that upon integration over the coordinates of the intermediate point this reduces in terms of the result for the two-point function in a magnetic field. Dissert. Abstr.

N82-10909 American Univ., Washington, D. C.
ENERGY LOSSES IN INDUCTIVE SUPERCONDUCTING SOLENOIDS WITH TIME VARYING CURRENTS Ph.D. Thesis
James Thomas Broach, Jr. 1981 120 p refs
Avail: Univ. Microfilms Order No. 8117925

A helium boil off technique was used to measure losses in inductive, multilayer superconducting solenoids carrying time varying transport currents and comparisons are made with existing loss models. The coils were wound using commercially available, multifilament, NbTi conductors of varying filament sizes, twist rates, and conductor geometries. Loss measurements were made for pulsed dc and 60 Hz ac transport currents. The pulsed dc data were taken as a function of peak magnetic field at 10 Hz and as a function of frequency (1-10 Hz) at a constant magnetic field. The 60 Hz ac loss data were taken as a function of magnetic field. Conventional loss models are reviewed, and expressions for coil losses for full and partial penetration were developed. Dissert. Abstr.

N82-10910 California Inst. of Tech., Pasadena.
LOW TEMPERATURE PHOTOLUMINESCENCE PROPERTIES OF SILICON AND SILICON GERMANIUM ALLOYS Ph.D. Thesis
Gordon Stuart Mitchard 1981 213 p
Avail: Univ. Microfilms Order No. 8118979

Three examples of the application of the photoluminescence technique to indirect semiconductors at low temperatures are presented. The effect of increasing concentrations on the photoluminescence spectrum was studied. Results for the Si:(B,In) system are presented. As the In concentration is increased, quenching of B luminescence are observed. A model based on exciton transfer from B to In impurities, which agrees well with the experimental results when the exchange mechanism is assumed for the transfer is proposed. Dissert. Abstr.

N82-10911 Colorado State Univ., Fort Collins.
TWO-DIMENSIONAL OXYGEN CLUSTERS AND FILMS ABSORBED ON GRAPHITE Ph.D. Thesis
Ru-Pin Chao Pan 1981 91 p
Avail: Univ. Microfilms Order No. 8119723

The orientations, structures and phase transitions of two dimensional oxygen molecular clusters adsorbed on the graphite plane were studied using the Monte Carlo method. Orientation phase transitions were found for all cluster sizes studied. Melting temperatures show agreement with measured values for extremely low coverage films. Two different approximations were used in the cluster studies. In one approximation, the interaction between a cluster and the surface was ignored and the center of mass of each oxygen molecule was fixed on a plane. In the other case an atom-atom Lennard-Jones potential was used to determine the surface interaction. An analytic expression was used for the summation over all the carbon atoms in the graphite. The minimal energies and structures of infinite adsorbed films were studied using an energy minimization method. Dissert. Abstr.

N82-10912 Pennsylvania Univ., Philadelphia.
OPTICAL PROPERTIES OF QUASI ONE DIMENSIONAL SYNTHETIC METALS Ph.D. Thesis
Dale Lewis Peebles 1981 180 p
Avail: Univ. Microfilms Order No. 8117832

The electronic and optical properties of two synthetic metals, Hg2.82AsF6 and (SNBr0.4) sub x; and of trans(CH) sub x, a semiconductor that can become a metal when doped, are described. Reflectivity studies of the structures of the synthetic metals are presented, and fit to the Drude formula is considered. Perpendicular reflectance, electronic anisotropy, and changes in dc conductivity are described. The photovoltaic effect of trans(CH) sub x was investigated. Reflectance and electronic anisotropy are considered and its semiconductor characteristics described in detail. Dissert. Abstr.

N82-10913 City Univ. of New York, N. Y.
ENERGY TRANSFER IN THE PRIMARY STAGES OF THE PHOTOSYNTHETIC PROCESS INVESTIGATED BY PICOSECOND TIME RESOLVED FLUORESCENCE SPECTROSCOPY Ph.D. Thesis
Francesco Pellegrino 1981 360 p
Avail: Univ. Microfilms Order No. 8119756

The fate of the absorbed light energy in the primary stages of the photosynthetic process was studied. In particular, the energy transfer in the accessory pigment complex consisting of carotenoids, Chl. a and Chl. b in higher green plants and phycobiliproteins in blue-green algae were investigated. These accessory pigments are responsible for the highly efficient transfer of the excitation energy to the photochemically active reaction center traps. The risetime, decay time, fluorescence depolarization, temperature and intensity dependence of the fluoresence emission from higher green plant and algal photosystems were directly measured. Excitation was provided by single picosecond laser pulses, as well as a train of pulses at 530 nm, within an intensity range of 10 to the 12th power to 10 to the 16th power photons/sq cm per pulse. Dissert. Abstr.

N82-10914 Virginia Univ., Charlottesville.
METAL/GaAs INTERFACES: THE SCHOTTKY BARRIER Ph.D. Thesis
Atilla Aydinli 1981 313 p
Avail: Univ. Microfilms Order No. 8117920

The analysis of metal-GaAs interfaces in a attempt toward improving Schottky mixer diodes for mm wave applications is described. The interfaces were investigated employing C-V and I-V measurements and Auger electron Spectroscopy (AES). The theory of Auger process along with its application to the specific problem at hand is discussed. The Pt/GaAs interface is studied with different chemical treatments and laser annealing conditions. Electrical measurements are carried out and correlated to AES results. It is found that excess As degrades electrical performance of Schottky diodes. Au/GaAs and Au/Pt interfaces are discussed for their relevance in Schottky diodes. A specific ohmic contact to GaAs is analyzed and the result discussed in ohmicity formation. Dissert. Abstr.

N82-10915 Louisiana State Univ. and A&M Coll., Baton Rouge.
ENERGY BANDS IN SOME TRANSITION METALS

Ph.D. Thesis
Duane Giles Laurent 1981 128 p
Avail: Univ. Microfilms Order No. 8117635

Self consistent linear combination of Gaussian orbitals energy band calculations were performed for the two paramagnetic 3d transition metals, chromium and vanadium. The energy bands densities of states and Fermi surfaces were obtained using the two most popular local exchange correlation potentials (Kohn-Sham-Gaspar and von Barth-Hedin) for chromium and the Kohn-Sham-Gaspar potential alone for vanadium. A comparison was made with the available experimental data. New interpretations for some of the neutron scattering data are made in the chromium case. Results are also presented for the Compton profiles and optical conductivities. These correlate well with the experiments if appropriate angular averages (for the Compton profile) and lifetime effcts (for the optical conductivity) are included. The electron energy loss spectrum, computed over the range 0-6.5 eV agreed well with experiment. Dissert. Abstr.

N82-10916 Virginia Univ., Charlottesville.
THEORY OF RESONANT ATOM SURFACE SCATTERING Ph.D. Thesis
James Sedwick Hutchison 1980 90 p
Avail: Univ. Microfilms Order No. 8117899

The general features of resonant atom surface scattering are reviewed and several previous approaches to the scattering problem are discussed. An alternate description is developed which separates the potential into a corrugated repulsion and a laterally smooth long range attraction. The resulting formulation explains qualitative features of the observed spectra in an inituitive way and additionally provides an efficient method for quantitative calculation. Dissert. Abstr.

N82-10917 Pennsylvania Univ., Philadelphia.
RESONANT RAMAN SCATTERING AT InAs INTERFACES Ph.D. Thesis
Lih-Ying Ching 1981 111 p
Avail: Univ. Microfilms Order No. 8117769

An investigation of semiconductor surface space charge regions in InAs surfaces in air and in metal oxide semiconductor (MOS) junctions is described. Resonant Raman scattering at the E sub 1 energy gap of InAs by longitudinal optical (LO) phonons, and that coupled modes with charge carrier excitations, was used. Backscattering data were obtained using laser excitation frequencies in the vicinity of the E sub 1 gap where LO phonon scattering mechanisms, i.e., allowed deformation potential and electro-optic scattering mechanisms, and forbidden electric field induced and wave vector dependent scattering mechanisms, are strongly enhanced. Polarization selection rules were used, in the case of (100) surfaces, to distinguish the allowed and forbidden scattering mechanisms and, in the case of (111) surfaces to observe their interference. Dissert. Abstr.

N82-10918 State Univ. of New York at Binghamton.
HEAT PULSE TRANSMISSION ACROSS A SOLID HE 1 INTERFACE Ph.D. Thesis
Nathaniel Ellmaker Hager, III 1981 155 p
Avail: Univ. Microfilms Order No. 8118946

A study of the thermal boundary resistance (Kapitza Resistance) between a solid crystal and liquid Helium 1 was made. Measurements were made by use of the fast heat pulse technique, allowing a direct observation of phonons emitted from the solid surface into the helium. Separate pulses originating from longitudinal and transverse crystal modes was resolved at the detector. An initial transient occurring at the beginning of the detected longitudinal pulse was used as a reference for the magnitude of the energy crossing the boundary. Changes in the detected signal are noted for variations in input pulse amplitude and detector positioning. A comparison of these and other results with previous boundary resistance measurements is made.
Dissert. Abstr.

N82-10919 Pennsylvania Univ., Philadelphia.
ATOMIC STRUCTURE AND INTERACTIONS AT SINGLE CRYSTAL METAL SURFACES Ph.D. Thesis
Raymond Tzutse Tung 1981 190 p
Avail: Univ. Microfilms Order No. 8117868

The aim of the research was to broaden the range of available surface diffusion data, specifically extending the established technique to include lighter metals of metallurgical and theoretical interest, and to investigate the capabilities and limitations of the FiM for determining the atomic structure of metal surfaces that are known to display clean surface reconstruction. Accordingly the diffusional chaacteristics of nickel and aluminum surfaces were examined, using an extension of routine FiM procedures, and the atomic structure of W, Mo and Nb(001) surfaces were studied using a new procedure which provides results that clearly demonstrate the power of the FiM technique for the study of surface reconstruction. Dissert. Abstr.

N82-10920 California Inst. of Tech., Pasadena.
MOESSBAUER EFFECT STUDIES IN YTTRIUM BASED METALLIC GLASSES Ph.D. Thesis
Michael Alan Tenhover 1981 111 p
Avail: Univ. Microfilms Order No. 8118922

The short range order of a variety of yttrium-3d transition metal glasses was investigated using Fe57 Mossbauer effect (ME) spectroscopy. It was found that the ME spectra of these glasses could best be described in terms of a model which assumes two kinds of sites for the 3d elements. The nature of the two sites is radically different depending on whether the transition metal is Mn, Fe, Co, and Ni or Cu and Zn. The difference in the structure of these glasses is attributed to the same factors which determine whether a C-15 crystalline compound is stable in equilibrium. The microscopic nature of ME spectroscopy provides an interesting comparison between the nature of the short range order in crystalline and amorphous alloys. The process of crystallization was also studied for a few glasses, and was found to occur in two distinct steps associated with the formation of hcp Y and C-15 compound. A high field superconducting material was designed. Dissert. Abstr.

N82-10921 State Univ. of New York at Albany.
PHASE DIAGRAMS OF TWO-DIMENSIONAL LATTICE SPIN MODELS Ph.D. Thesis
George Orland Williams 1981 101 p
Avail: Univ. Microfilms Order No. 8118760

The phase diagrams are determined for two separate two dimensional lattice spin models. General q state planar spin models on a square lattice are studied for q = 2-7. The phase diagrams are calculated by a variational method and the infinitesimal Migdal renormalization group (RG) transformations. All exactly known critical points are reproduced together with a fair numerical simulation of lines of critical joints; existence of massless phases for q = 6 and 7 are clearly indicated. The two dimensional axial next nearest neighbor Ising (ANNNI) model is studied by perturbation theory and numerically using finite lattice results. Although no clear evidence for the existence of a massless phase is obtained, the phase boundaries obtained give a strong indication of the presence of a sinus phase between the paramagnetic phase and the < 2 > antiphase. Dissert. Abstr.

N82-10922*# Lincoln Lab., Mass. Inst. of Tech., Lexington. Solid State Div.
SOLID STATE RESEARCH Quarterly Technical Summary Report, 1 Nov. 1980 - 31 Jan. 1981
Alan L. McWhorter 15 Feb. 1981 80 p refs Sponsored in part by Army, DARPA, Navy, NASA and DOE
(Contract F19628-80-C-0002; AF Proj. 649L)
(NASA-CR-164796; AD-A103887; ESD-TR-81-7) Avail: NTIS HC A05/MF A01 CSCL 20/12

This report covers in detail the solid state research work of the Solid State Division at Lincoln Laboratory for the period 1 November 1980 through 31 January 1981. The topics covered are Solid State Device Research, Quantum Electronics, Materials Research, Microelectronics, and Analog Device Technology. GRA

N82-10923# Varian Associates, Palo Alto, Calif. Solid State Lab.
RESEARCH ON LATTICE-MISMATCHED SEMICONDUCTOR LAYERS Final Report, 24 Sep. 1979 - 24 Sep. 1980
C. Burleigh III Cooper Nov. 1980 61 p refs
(Contract DE-AC03-79SF-10610)
(DOE/SF-10610/T1) Avail: NTIS HC A04/MF A01

The epitaxial growth of Al GaAsSb and the component binary and ternary alloys by organometallic vapor phase epitaxy (OM-VPE)

is reported. The OM-VPE growth of the binary compounds, GaAs and GaSb, and ternary compounds, AlGaAs, AlGaSb, AlAsSb, and GaAsSb, are discussed, and the Sb-containing alloys are emphasized. Growth parameters are reviewed and it is noted that the growth temperatures and ratio of input fluxes for the growth of Sb rich alloys are different from the conditions for the growth of As rich alloys. The binary ternary components are integrated to grow the quaternary, AlGaAsSb. The exploration of III-V compound materials which can be grown by OM-VPE is discussed. DOE

N82-10924# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
ROLE OF ENERGY EXCHANGE IN VIBRATIONAL DEPHASING PROCESSES IN LIQUIDS AND SOLIDS Ph.D. Thesis
S. Marks Aug. 1981 171 p refs Sponsored in part by NSF
(Contract W-7405-eng-48)
(DE81-029819; LBL-13124) Avail: NTIS HC A08/MF A01

Three theories on the dephasing of molecular vibrations in condensed phase matter are presented. The theories predict that the widths and shifts of molecular vibrations will obey an Arrhenius temperature dependence. A model based on intermolecular energy exchange of low frequency modes, results in dephasing the high frequency modes when anharmonic coupling is present. Isotopic dilution resulted in a detailed picture of the energy transfer dynamics of the low frequency modes. Spontaneous Raman spectra support a model of inhomogeneous broadening in liquids based on results of picosecond stimulated Raman spectroscopy. The model distributes environmental sites created by a distribution in the local density and creates inhomogeneous broadening. DOE

N82-10925# Northwestern Univ., Evanston, Ill. Dept. of Materials Science and Engineering.
EFFECT OF POINT DEFECTS ON MECHANICAL PROPERTIES OF METALS Technical Progress Report, 1 Sep. 1980 - 31 Jul. 1981
M. Meshii Jul. 1981 4 p
(Contract DE-AS02-76ER-01367)
(DE81-028882; DOE/ER-01367/T1; COO-1367-130) Avail: NTIS HC A02/MF A01

Research activities areas of low temperature plastic deformation of niobium and niobium oxygen single crystals, and the effect of hydrogen on the plastic deformation and fracture of iron are reported. DOE

N82-10926# Illinois Univ., Urbana. Dept. of Physics.
COHERENT BREMSSTRAHLUNG AND CHANNELING RADIATION FROM ELECTRONS OF ONE TO THREE MeV IN SILICON AND GOLD Ph.D. Thesis
James Edwin Watson 1981 105 p refs
(Contract DE-AC02-76ER-01198)
(DE81-029490; DOE/ER-01198/1362) Avail: NTIS HC A06/MF A01

The observation of sharp peaks in the X-ray spectrum from 1 to 3 MeV electrons striking thin single crystals of silicon and gold is reported. These peaks were observed in the range 1 to 25 keV. The peaks are of two different origins, both direct results of the periodic nature of the target crystals. The first kind of radiation is caused by the interference of incoming and scattered electron wave functions. Because of the periodicity of the target material there is coherence effect for certain bremsstrahlung wave vectos. Detailed agreement between theoretical prediction and observation in silicon is shown. The second kind of radiation is caused by electrons channeled along major crystal axes. The electrons enter certain quantized orbits as they channel and may emit photons as a consequence of transitions between the various orbits. Observations of channeling radiation for various crystal axes in silicon are presented. Both phenomena were observed in gold. DOE

N82-10927# Argonne National Lab., Ill.
VORTEX UNBINDING IN SUPERCONDUCTING THIN FILMS
Peter A. Bancel and Kenneth E. Gray 1980 5 p refs Presented a the Intern. Conf. on Ordering in Two Dimensions, Lake Geneva, Wisc., 28-30 May 1980
(Contract W-31-109-eng-38)
(DE81-023540; CONF-800561-4) Avail: NTIS HC A02/MF A01

The study of the origin of broad resistive transitions in 2D superconducting films requires extremely homogeneous samples. Granular aluminum evaporated onto freshly eleaved mica substrates are shown to satisfy this criterion. Values of T/sub c/, as a function of resistance per square, are in agreement with a one parameter model of independent grains coupled by the Josephson effect, and not the predictions o the Kosterlitz-Thouless vortex unbinding model. DOE

N82-10928# Argonne National Lab., Ill. Materials Science Div.
ENERGIES OF <110> COINCIDENCE TWIST BOUNDARIES, STACKING FAULTS, AND FREE SURFACES IN METAL OXIDES WITH NaCl STRUCTURE
Dieter Wolf New York City Plenum Publishing Corp. 1980 12 p refs Presented at the 7th LLR/MMRD Intern. Symp. of Interfaces in Glass-Metal Systems, Berkeley, Calif., 28 Jul. - 1 Aug. 180
(Contract W-31-109-eng-38)
(DE81-203113; CONF-800765-9) Avail: NTIS HC A02/MF A01

A computer code developed for the determination of energies and structures of coincidence twist boundaries, stacking faults, and free surfaces is applied to MgO and NiO for which the energies of such <110> interfaces and the free surface are determined starting from empirical ionic central potentials. DOE

N82-10929# Sandia Labs., Albuquerque, N. Mex.
RESHOCK AND RELEASE BEHAVIOR OF BERYLLIUM
L. C. Chhabildas, J. L. Wise, and J. R. Asay 1981 9 p refs Presented at the APS Conf. on Shock Wave in Condensed Matter, Menlo Park, Calif., 23 Jun. 1981
(Contract DE-AC04-76DP-00789)
(DE81-024064; SAND-80-2864C; CONF-810684-19) Avail: NTIS HC A02/MF A01

Reshock and release wave profile measurements in beryllium over the stress region 6 to 35 GPa were taken. The results indicated no evidence of an hcp-bcc phase transition as previously suspected. The measurements show that the yield strength of the material is 1.8 GPa at 34 GPa, a substantial increase from the ambient value of 0.3 GPa. DOE

N82-10930# Argonne National Lab., Ill. Materials Science Div.
DEFORMATION MICROSTRUCTURES AND MECHANICAL EQUATIONS OF STATE
A. P. L. Turner and T. Hasegawa (Tokyo Univ. of Agriculture and Technology, Japan) 1980 30 p refs Presented at the ASTM Conf. on Mech. Testing for Deformation Model Develop., Bal Harbour, Fla., 12-13 Nov. 1980
(Contract W-31-109-eng-38)
(DE81-023839; CONF-801148-6) Avail: NTIS HC A03/MF A01

Results of experiments involving various monotonic and cyclic deformation paths and annealing treatments are described. The results show that a state variable theory for constitutive behavior must be based on several independent parameters. Correlations which show that different mechanical responses may depend on the same state variables are discussed. TEM characterization of the microstructures developed during the tests are reported. Some correlations between microstructure and mechanical behavior are shown, but other cases are reported where no correlation can be found. DOE

N82-10931# Mound Lab., Miamisburg, Ohio.
QUADRUPOLE INTERACTIONS IN LIQUID AND SOLID DEUTERIUM
G. T. McConville and David White 1981 2 p refs Presented at the 16th Intern. Conf. on Low Temp. Phys., Los Angeles, 19 Aug. 1981
(Contract DE-AC04-76DP-00053)
(DE81-769974; MLM-2817(OP); CONF-810809-7) Avail: NTIS HC A02/MF A01

From differential vapor pressure measurements in both liquid and solid deuterium, an effective D2 molecular quadrupole moment

was determined from observed nonidealities of ortho-para mixtures. DOE

N82-10932# Sandia Labs., Albuquerque, N. Mex.
SHOCK-INDUCED DEFECTS IN CADMIUM SULFIDE
B. W. Dodson and E. L. Venturini 1981 5 p refs Presented at the APS Conf. on Shock Waves in Condensed Matter, Menlo Park, Calif., 23 Jun. 1981
(Contract DE-AC04-76DP-00789)
(DE81-023167; SAND-81-1354C; CONF-810684-15) Avail: NTIS HC A02/MF A01

The explosive shock loading of CdS powders pressed to 50 percent of theoretical density in a copper recovery capsule, to pressures in the copper of about 3, 13, and 20 GPa is described. Preservation of the samples for post shock study is considered. No residual structural changes were detected via X-ray diffraction, but large densities (approximately 10 quadrillion/cu cm) of two types of defects were detected using electron spin resonance techniques. One defect had an isotropic spectrum, with g = 2.0028, and the other had an axial spectrum with g/sub parallel/ = 1.790 and g/sub perpendicular to/ = 1.775. The axial defect seems to be connected with the wurtzite-rocksalt phase transition in CdS. DOE

N82-10933# Sandia Labs., Albuquerque, N. Mex.
CRYSTALLOGRAPHIC PROPERTIES OF LITHIUM NIOBATE SHOCK-LOADED FROM 3.7 TO GPa AND PRESERVED FOR POST-SHOCK STUDY
B. Morosin and R. A. Graham 1981 5 p refs Presented at the APS Conf. on Shock Waves in Condensed Matter, Menlo Park, Calif., 23 Jun. 1981
(Contract DE-AC04-76DP-00789)
(DE81-023168; SAND-81-1315C; CONF-810684-16) Avail: NTIS HC A02/MF A01

Optical and X-ray diffraction observations are reported for lithium niobate crystals which were subjected to shock loading along the c axis and recovered for post-shock study. At pressures of 3.5 and 5.5 GPa, no unusual X-ray diffraction results are observed. Optical observations on these samples show planar features similar to prior observations in other crystals. At 9.5 and 19 GPa, the X-ray observations indicate that the samples are recrystallized into micro size crystalites with well coordinated crystallographic alignment changes from the original crystal axis. The observed effects are thought to be initiated by localized heating accompanying heterogeneous yielding. DOE

N82-10934# Argonne National Lab., Ill.
NbN MATERIALS DEVELOPMENT FOR PRACTICAL SUPERCONDUCTING DEVICES
R. T. Kampwirth and K. E. Gray 1980 5 p refs Presented at the Appl. Superconductivity Conf., Santa Fe, N. Mex., 29 Sep. - 2 Oct. 1980
(Contract W-31-109-eng-38)
(DE81-023891; CONF-800980-38) Avail: NTIS HC A02/MF A01

The preparation of thick wide film of NbN on suitable substrates, using reactive sputtering and to characterize the films for superconductivity and to determinate sputtering parameters is reported. Severe degradation in J/sub c/ was observed with increasing film width and for millisecond current pulses. It is suggested that this degradation could be substantially reduced by stabilization with either low rho/sub n/ normal metal or the use of a sapphire substrate. The resistivity and critical current dependence both imply Josephson coupled grains. DOE

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer*.

N82-10935 Texas Univ. at Arlington.
QUANTUM FIELD THEORY IN STATIONARY COORDINATE SYSTEMS Ph.D. Thesis
Jonathan David Pfautsch 1981 163 p
Avail: Univ. Microfilms Order No. 8119354

Quantum field theory in stationary coordinate systems in Minkowski space was examined. Preliminary to quantization of the scalar field, all of the possible stationary coordinate systems in flat spacetime are classified and explicitly constructed. Six distinct classes of such systems are found. The scalar field is canonically quantized and a vacuum defined in each of the particular coordinate systems chosen. The responses of monopole detectors traveling along stationary world lines are calculated in both the Minkowski and Fulling vacuums. Quantization of the scalar field within a rotating wedge is examined. The asymptotic form of the renormalized stress tensor near the surfaces is calculated and is found to include momentum terms which represent a circulation of energy within the wedge. Author

N82-10936 City Univ. of New York, N. Y.
THERMOELECTRIC CONVERSIONS BASED ON NOISE RECTIFICATION Ph.D. Thesis
Andrei Cernasov 1981 178 p
Avail: Univ. Microfilms Order No. 8119649

A complete analysis of the feasibility, operation, and performance of heat engines based on the rectification of thermal noise is presented. Both the close to thermodynamic equilibrium and 'far from thermodynamic equilibrium' cases are considered. All standard thermodynamic results, including the Second Law, are found to hold for all cases. While high efficiencies and output power densities are possible, if normal exponential type diodes are used the small physical sizes of efficient fluctuation heat engines are beyond the capabilities of present technology. However, no thermodynamics reasons for the weakly nonlinear character of practical diodes, like PN junctions, are found. Since high nonlinearity ca compensate for large system sizes, when highly nonlinear diodes are discovered, efficient fluctuation heat engines could become feasible. Dissert. Abstr.

N82-10937 Texas Univ. at Dallas.
CONTRIBUTIONS TO THE DYNAMICAL FORMULATION OF GENERAL RELATIVITY Ph.D. Thesis
Mauro Carfora 1981 163 p
Avail: Univ. Microfilms Order No. 8118234

The (3 + 1) dynamical formulation of general relativity was investigated. The introduction of a suitable dynamical gauge which allows identification of the dynamical degrees of freedom of the gravitational field and the kinematics of spacelike foliations, in particular of the mechanism which halts the description of the dynamics of a 3-geometry with respect to a given foliation are discussed. The shift vector field beta for a given foliation provide automatically the transverse traceless part of the second fundamental form K associated with the slices of the foliation specified. Smarr & York's prescription for foliating spacetime, and the circumstances a large class of such foliations become critical are discussed. It is found in the class of foliations considered, the maximal foliations cover the largest part of the Cauchy development. Dissert. Abstr.

N82-10938# Battelle Columbus Labs., Ohio
THERMOPHYSICAL PROPERTIES OF COAL LIQUIDS Quarterly Technical Status Report, 1 Apr. - 30 Jun. 1981
J. W. Droege, R. Venkateswar, and S. P. Chauhan 17 Jul. 1981 40 p
(Contract DE-AC22-79ET-14941)
(DE81-0279446; BMI-2086; QTSR-7) Avail: NTIS HC A03/MF A01

The rheological properties of coarse coal which grind at relatively low temperature (450 K) showed a substantially lower viscosity. It is also shown that coal and solvent from a plant give slurries of much higher viscosity than slurries from reference coal and solvent. The same relationships are shown at higher temperatures. The effect of solvent to coal ratio is also very great. Differential scanning calorimetry give low reliability specific heat results and a probable heat effect at about 500 K is shown. DOE

N82-10939# Colorado School of Mines, Golden.
ENTHALPY MEASUREMENT OF COAL-DERIVED LIQUIDS Technical Progress Report, May - Jun. 1981
A. J. Kidnay and V. F. Yesavage 15 Jul. 1981 14 p
(Contract DE-AC22-81PC-40787)
(DE81-029481; DOE/PC-40787/1) Avail: NTIS HC A02/MF A01

Enthalpy for coal derived liquids on the model compound quinoline was measured. Compounds over the pressure and temperature and temperature regions encountered in liquification and processing systems were modeled. Preliminary results are presented for the temperature region 186 to 7320 F along isobars of 75, 100, and 200 psia. DOE

N82-10940# Arizona State Univ., Tempe. Dept. of Chemistry.
THERMODYNAMIC PROPERTIES OF CRYSTALS AND MELTS BASED ON CALORIMETRIC DATA AND PLAGIOCLASE-MELT EQUILIBRIA IN THE SYSTEM ALBITE-ANORTHITE-DIOPSIDE
D. J. Henry, A. Navrotsky, and H. D. Zimmerman (Aarhus Univ.) May 1981 46 p refs Submitted for publication
(Contract DE-AC02-80ER-10765)
(DE81-024473; DOE/ER-10765/T1) Avail: NTIS HC A03/MF A01

Thermochemical data for high plagioclase (P) solid solutions and for glasses in the system albite-anothite-diopside (AAD) can be coupled with the heats of fusion of albite and anorthite, ion exchange equilibria between P crystal and aqueous fluid, and coexisting P and melt compositions in AAD to produce a consistent model of mixing properties in crystals and melts in AA. the crystalline high temperature Ps are described by positive heats of mixing and an aluminum-avoidance entropy model. Liquids in the region of the P saturation surface of AAD are shown to have entropies of mixing significantly less positive than predicted by the two lattice model of Weill et al. (1980), which was adequate for the pyroxene saturation surface of that system. Along the AA binary these deviations are not consistent with aluminum avoidance in the liquid, but can be described by an empirical regular excess entropy term or the assumption of strong Ca-Al charge balance. DOE

N82-10941# Sandia Labs., Albuquerque, N. Mex.
SANDIA SHOCK THERMODYNAMICS APPLIED RESEARCH FACILITY
Lalit C. Chhabildas 1981 5 p refs Presented at the APS Conf. on Shock Waves in Condensed Matter, Menlo Park, Calif. 23 Jun. 1981
(Contract DE-AC04-76DP-00789)
(DE81-024066; SAND-81-1528C; CONF-810684-1) Avail: NTIS HC A02/MF A01

The Sandia Shock Thermodynamics Applied Research Facility is described. Three different smoothbore guns are used to launch projectiles for controlled planar impact studies. Combined pressure-shear loading conditions can also be obtained through use of an intervening anisotropic crystal. Time-resolved interferometric and holograhic instrumentation is used for diagnostics. This facility has the unique capability of providing time-resolved measurements in shock loaded specimens over the stress range 0.1 to 700 GPa. DOE

N82-10942# Research Inst. of National Defence, Stockholm (Sweden). Huvudavdelning 2.
COMPUTER PROGRAM FOR THERMOCHEMICAL EQUILIBRIUM CALCULATIONS ACCORDING TO GORDON-MCBRIDE, NASA SP-273 [DATAPROGRAM FOER TERMOKEMISKA JAAMVIKTSBERAAKNINGAR ENLIGT GORDON-MCBRIDE, NASA SP-273]
Sven-Erik Flygar Sep. 1980 26 p ref In SWEDISH
(FOA-C-20367-D3) Avail: NTIS HC A03/MF A01

The modifications include: dimensions noted in SI-units; and easier reading and handling of recorded data, resulting in a much shorter calculation-time. The correction of an error in the original NASA-program, concerning the calculation of the internal energy of the combustion products is reported. Author (ESA)

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

N82-10943# Research Inst. of National Defence, Stockholm (Sweden). Huvudavdelning 5.
GROUP COMMUNICATION VIA COMPUTER. INTRODUCTORY SOCIOPSYCHOLOGICAL STUDIES ON THE KOM-SYSTEM AT RESEARCH INSTITUTE OF NATIONAL DEFENCE, PART 1 [GRUPPKOMMUNIKATION VIA DATOR: INLEDANDE SOCIALPSYKOLOGISKA STUDIER PAA KOM-SYSTEMET VID FOA, RAPPORT 1]
Lillemor Adrianson Oct. 1980 89 p refs In SWEDISH 2 Vol.
(FOA-C-56023-H9(M3)-Vol-1) Avail: NTIS HC A05/MF A01

The system was brought into service in 1978, after a feasability study. Potential users were at that time well disposed, regarding the KOM-system. Wider contact, cohesion within the group, and time saving were expected. After one year, the same persons who worked with the system, were asked to give their opinion. Positive expectations are generally met. Author (ESA)

N82-10944# Research Inst. of National Defence, Stockholm (Sweden). Huvudavdelning 5.
GROUP COMMUNICATION VIA COMPUTER. INTRODUCTORY SOCIOPSYCHOLOGICAL STUDIES ON THE KOM-SYSTEM AT THE RESEARCH INSTITUTE OF NATIONAL DEFENCE, PART 2 [GRUPPKOMMUNIKATION VIA DATOR: INLEDANTE SOCIALPSYKOLOGISKA STUDIER PAA KOM-SYSTEMET VID FOA. RAPPORT 2]
Lillemor Drianson and Lennart Sjoeberg Oct. 1980 139 p refs In SWEDISH 2 Vol.
(FOA-C-56024-H9(M3)-Vol-2) Avail: NTIS HC A07/MF A01

The psychosocial aspects associated with the use of the KOM teleconferencing system are discussed. The opinions of several KOM users are reported with respect to the capability of the system to bridge the gap between groups of people scattered over great distances. A sample questionaire is presented as well as all tallied results. R.C.T.

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N82-10945# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Apparate.
HOW CAD/CAM AFFECTS TASK COMPLEXITY IN MANAGEMENT PLANNING: ORGANIZATIONAL, STRUCTURAL, AND PERSONNEL IMPLICATIONS [WIE VERAENDERT CAD/CAM DEN AUFGABENBEREICH DER AV]
Julius Weyand 30 Jun. 1980 17 p In GERMAN
(MBB-UA-547/80-OE) Avail: NTIS HC A02/MF A01

The impact of computer systems on management methods is assessed. Through the introduction of CAD/CAM into an enterprise, a wide range of information acquisition, processing and communication procedures are fundamentally changed. Essential characteristics of this change are: (1) systems which support information acquisition are partially, or even wholly, automated; (2) total integration of systems can be achieved; and (3) data are acquired only once (preferably at the source) and used in accordance with the requirements of all associated systems. Author (ESA)

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software*.

N82-10946 Wisconsin Univ. - Madison.
ON THE USE OF DATA-FLOW TECHNIQUES IN DATABASE

MACHINES Ph.D. Thesis
Haran Boral 1981 238 p
Avail: Univ. Microfilms Order No. 8116638

It is shown that major data base machine designs suffer from some flaw leading to the inefficient execution of one or more operations. A number of possible algorithms for the relational algebra operators are considered and a design based on these is proposed. The proposed machine utilizes a local network communication mechanism and employs a data flow strategy for processing. It is shown how such a strategy can be employed without large control overhead. Also, the problem of associating logic with a disk for the implementation of certain operations 'on the fly' is considered. Three design approaches are examined and compared. It is shown how an associative disk can be incorporated into a data base that supports both on-the-disk and off-the-disk processing. Dissert. Abstr.

N82-10947 Polytechnic Inst. of New York, Brooklyn.
AN EFFICIENT IMPLEMENTATION OF A SYNTACTIC MODEL FOR SEMANTIC INTEGRITY IN DATA BASE SYSTEMS Ph.D. Thesis
Samuel Davidovics 1981 150 p
Avail: Univ. Microfilms Order No. 8118868

The semantic integrity of a data base is defined in terms of a complete set of predicates on its record type. These predicates are shown to define a type 3 grammar and thus determine the specification of a finite data automata which will detect, by syntactic checking, whether the semantic integrity of the data base has been violated. Moreover, if the record types are of length n, these automata will make the determination in O(N) time. Implementation procedures and optimization techniques are explored to further reduce search time. Dissert. Abstr.

N82-10948 Pennsylvania Univ., Philadelphia.
VIRTUAL MERGING OF DATABASES Ph.D. Thesis
Amihai Motro 1981 211 p
Avail: Univ. Microfilms Order No. 8117816

Even with the increased use of large and complex databases, it often happens that the information required for a specific application extends over two or more physically independent databases. The writing of such applications is considerably simplified if the databases appear to the programmer as a single integrated database. However, the cost of performing any physical restructuring may be prohibitive and many impose unnecessary constraints on the structure and content of the database as it is viewed by the original users. A method was developed that performs a virtual merge of existing independent databases: it presents the user with a larger conceptual structure that may be queried without compromising the independence of the existing databases. Dissert. Abstr.

N82-10949 California Inst. of Tech., Pasadena.
COMMUNICATIVE DATABASES Ph.D. Thesis
Kwang-I Yu 1981 152 p
Avail: Univ. Microfilms Order No. 8118610

A hierarchical organization stores its information in a large number of databases. These databases are interrelated, forming a closely coupled database system. Traditional information systems and current database management systems do not have a means of expressing these relationships. A model of the information structure of the hierarchical organization that identifies the nature of database relationships is described. The design and implementation of the Communicative Database Management System (CDMS) is also described. Dissert. Abstr.

N82-10950 Aeronautical Research Labs., Melbourne (Australia).
COMMAND AND INFORMATION SYSTEM PROGRAMMING AND OPERATION MANUAL
D. K. Warne, T. Kinsella, and H. A. Thelander Sep. 1980 30 p
(ARL-SYS-Note-74; AR-002-233) Copyright. Avail: Issuing Activity

The reference manual for CISPAC, DECsystem-10 FORTRAN callable subroutine package for driving command and information system mark1 CIS is outlined. Two utility programs for on-line display of DECsystem-10 text and plot files are described. DECsystem-10 and PDP-11/20 programming for CIS is covered, the hardware is described, and the process of generation of alphanumeric and symbolic character fonts for use with it is explained. E.A.K.

N82-10951 British Library Lending Div., Boston Spa (England).
THE TRAVELING WORKSHOP EXPERIMENT IN LIBRARY USER EDUCATION
D. Clark, C. G. S. Harris, P. J. Taylor, A. Douglas, and S. M. J. Lacey Mar. 1981 275 p refs
(BLL-BLRDR-5602; ISBN-0-905984-63-3; ISSN-0308-2385) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

Workshops on library use for students of biology, mechanical engineering, and social welfare were conducted. The learning materials developed for use in these workshops were made available as packages for librarians and lecturers to use themselves. The findings of an independent assessment of the traveling workshop experiment are presented. T.M.

N82-10952# Argonne National Lab., Ill.
SOLAR DATA BASE MANAGEMENT SYSTEM
I. Singh (Mohawk Coll., Hamilton, Ont.), R. M. Wolosewicz, H. Singh, and P. S. Chopra 1980 8 p refs Presented at the ASME Century 2 Emerging Technol. Conf., San Francisco, 12-15 Aug. 1980
(Contract W-31-109-eng-38)
(DE81-023122; CONF-800804-40) Avail: NTIS HC A02/MF A01

The data base management system established to handle the reliability and materials assessment data generated by over 100 solar heating and cooling systems was assessed. The planning, the design, and some of the software used to handle data processing and reduction requirements are described. DOE

N82-10953# VDI-Technologiezentrum, Berlin (West Germany).
DOCUMENTATION AND INFORMATION ON PROTECTIVE RIGHTS RELATING TO GOVERNMENT SUPPORT ON TECHNOLOGICAL RESEARCH AND DEVELOPMENT Final Report
Irmgard Gretscher Bonn Bundesministerium fuer Forschung und Technologie Dec. 1980 245 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-80-177; ISSN-0340-7608) Avail: NTIS HC A11/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 41

Patent applications filed in 1978 in government-sponsored research are listed. Applications of microelectronics, electronics, metallurgy and materials technology, non-nuclear energy and communication are included. Protective rights, inventor, license holder and descriptions of the invention with diagrams are given. Author (ESA)

N82-10954# Arbeitsgemeinschaft Ausseruniv. Historischer Forschungseinrichtungen, Munich (West Germany).
DOCUMENTATION OF LITERATURE IN THE HISTORICAL SCIENCES. ANALYSIS OF THE CURRENT SERVICES AND CONCEPT UTILIZATION OF AN INFORMATION AND DOCUMENTATION SYSTEM Final Report
Franziska Jungmann-Stadler Bonn Bundesministerium fuer Forschung und Technologie Sep. 1980 116 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-ID-80-012; ISSN-0170-8996) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 24,40

Current bibliographical services are analyzed by means of a standardized questionnaire. A concept for the documentation of recently published historical literature is introduced. In order to obtain an estimate of the size and the necessary expenditure, the annual output of publications is determined. The documentation process and the tools (data acquisition chart, classification, indexing tools and instructions) are described. As a fundamental improvement of the present information on literature, it is proposed to publish printed services and to establish a computer-aided information system as part of a general information system for the historical sciences. Author (ESA)

N82-10955 Sheffield Univ. (England). School of Librarianship and Information Science.
THEORETICAL APPROACHES TO INFORMATION RETRIEVAL
Tadeusz Radecki (Technical Univ. of Wroclaw) Apr. 1981 44 p refs
(BLL-BLRDR-5651) Avail: British Library Lending Div., Boston Spa, Engl.

A number of information retrieval techniques applicable in systems based on Boolean searches are introduced. Efforts are made to incorporate into the standard Boolean retrieval schemes a weighting mechanism to produce ranked lists of documents. Several alternative approaches are offered which are based on results of fuzzy set theory and fuzzy logic, probability theory and decision analysis, and the theory of Boolean functions. Topics covered include: (1) retrieval methods of documents indexed by weighted index terms; (2) similarity measures for Boolean search request formulations and their applications; (3) document-clustering-based information retrieval: document clustering utilizing previously formed query clusters; and (4) a probabilistic approach to information retrieval in systems with Boolean search request formulations. A.R.H.

N82-10956# Cambridge Univ. (England). Computer Lab.
RESEARCH ON RELEVANCE WEIGHTING 1976 - 1979
K. Sparck Jones and C. A. Webster 1980 68 p refs
(BLL-BLRDR-5553) Avail: British Library Lending Div., Boston Spa, Engl.

Experiments on relevance weighting of search terms are reported. The tests were designed to study the behavior of relevance weights in relation to other forms of request modification, and in the context of different collection environments, specifically those defined by variations in the amount of relevance information available for weight calculation. It is shown that relevance weighting is effective in a wide variety of situations, and effective even in very unfavorable circumstances. E.A.K.

N82-10957# Royal Coll. of Art, London (England). Graphic Information Research Univ.
THE PRESENTATION OF BIBLIOGRAPHIC INFORMATION ON PRESTEL
Linda Reynolds Mar. 1980 27 p refs
(BLL-BLRDR-5536) Avail: British Library Lending Div., Boston Spa, Engl.

The possibility of using color coding is discussed. Seven colors are available at no extra cost, however these colors differ in legibility and also in their apparent importance when viewed on the screen. The characteristics of Prestel displays, and in basic principles in the presentation of bibliographic information established in other media, a number of alternative designs for book lists on topical subjects are presented. Designs for author, title, date and classified listings are included. It is recommended that the layout is kept as simple as possible, and the number of colors used is restricted to two in most cases. E.A.K.

N82-10958# Liverpool Polytechnic (England). Dept. of Library and Information Studies.
TEACHING ON-LINE INFORMATION RETRIEVAL USING INTELLIGENT TERMINALS Final Report, Jul. - Nov. 1979
Bernard Houghton and Maria Fortune Dec. 1979 10 p refs
(BLL-BLRDR-5567) Avail: British Library Lending Div., Boston Spa, Engl.

The use of magnetic tape of a Hewlett-Packard 2645A Display Station to develop a series of teaching packages was examined. A workbook was compiled using printout of the searches with simple explanatory notes. It is anticipated that confidence is gained in use of the keyboard before a live search is undertaken. The commands are demonstrated in a meaningful way, as well as the systems and bases with their various disadvantages and advantages. E.A.K.

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

No abstracts in this category.

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

N82-10959# Committee on Science and Technology (U. S. House).
NASA AUTHORIZATION, 1982: INDEX
Washington GPO 1981 316 p Hearings on H.R. 1257 before the Comm. on Sci. and Technol., 97th Congr., 1st Sess., No. 2, 1981
(GPO-84-713) Avail: Committee on Science and Technology

A subject and name index is presented to the testimony delivered, statements received, and questions raised in relation to NASA's budget requests, for program management, construction of facilities, and research and development. A.R.H.

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety*, *16 Space Transportation*, and *44 Energy Production and Conversion*.

N82-10960# Committee on Science and Technology (U. S. House).
REVIEW OF 1980 FIVE-YEAR OUTLOOK REPORT ON SCIENCE AND TECHNOLOGY
Washington GPO 1981 100 p refs Hearing before the Subcomm. on Sci., Res., and Technol. of the Comm. on Sci. and Technol., 96th Congr., 2nd Sess., No. 180, 13 Jun. 1980
(GPO-67-284) Avail: Subcommittee on Science, Research and Technology

Current and emerging problems of national significance that are identified through scientific research, or in which scientific or technical considerations are of major significance, are described. Opportunities and constraints in science and technology were examined. The problems of accurately forecasting technological growth are discussed. T.M.

N82-10961# Los Alamos Scientific Lab., N. Mex.
DESIGN CONSIDERATIONS FOR VEHICULAR FUEL CELL POWER PLANTS
D. K. Lynn, J. B. McCormick, R. E. Bobbett, S. Srinivasan, and J. R. Huff 31 Mar. 1981 14 p refs Presented at 16th Intersoc. Energy Conversion Engr. Conf., Atlanta, 9-14 Aug. 1981
(Contract W-7405-eng-36)
(DE81-769737; LA-UR-81-1054; CONF-810812-7) Avail: NTIS HC A02/MF A01

Designs in fuel cells as an efficient, nonpolluting vehicular power source that can operate on nonpetroleum fuel were investigated. Phosphoric acid fuel cell power plant designs were studied to determine the performance level they would provide, both for a compact passenger vehicle and a 40 ft city bus. The fuel is steam reformed methanol. It is indicated that 1978 fuel cell technology provides a 22 to 50% improvement in fuel economy over the 1980 EPA estimate for the conventionally powered General Motors X car. A reasonable advanced in fuel cell

technology improves performance and fuel consumption of both vehicles substantially. DOE

N82-10962# Argonne National Lab., Ill.
STATUS OF NICKEL/ZINC AND NICKEL/IRON BATTERY TECHNOLOGY FOR ELECTRIC VEHICLE APPLICATIONS
N. P. Yao, C. C. Christianson, R. C. Elliott, and J. F. Miller 1980 43 p refs Presented at the 29th Power Sources Conf., Cherry Hill, N.J., 10-13 Jun. 1980
(Contract W-31-109-eng-38)
(DE81-023572; CONF-800612-6) Avail: NTIS HC A03/MF A01

Progress in nickel/zinc and nickel/iron technology was to achieve battery technical performance goals necessary for widespread use in electric vehicle applications is reviewed. Nickel/zinc module test data show a specific energy of nearly 70 Whr/kg and a specific power of 130 W/kg. Nickel/iron moduls demonstrate a specific energy of nearly 50 Wh/kg and a specific power of 100 W/kg. Energy efficiency is improved from less than 50 percent to over 65 percent. Cost reduction is emphasized in the development of both nickel/zinc and nickel/iron batteries to achieve the lowest possible life cycle cost to the battery user. DOE

N82-10963# Renault Vehicles Industriels (France). Direction des Etudes et Recherches.
THE EVOLUTION OF THE INDUSTRIAL VEHICLE BY THE YEAR 2000 [L'EVOLUTION DU VEHICULE INDUSTRIEL A L'HORIZON 2000]
Pierre Soret 1980 32 p In FRENCH Presented at SIA Journees Poids Lourds, Paris, 8-9 Oct. 1980
Avail: NTIS HC A03/MF A01

The possible evolution, if not probable, of those constraints which affect the design and use of tractor trucks is reviewed. These constraints include energy requirements, environmental codes, safety and security, reliability, and working conditions for the drivers. A profound change in the form and functioning of these vehicles is forecast. Author (ESA)

N82-10964# Unified Industries, Inc., Springfield, Va.
ELECTROMAGNETIC INTERFERENCE CHARACTERISTICS OF ADVANCED PROPULSION SYSTEMS FOR URBAN RAIL VEHICLES Final Report, Feb. 1980 - Feb. 1981
Vilas D. Nene Feb. 1981 173 p refs
(Contract DTUM60-80-C-72025)
(PB81-212730; UMTA-VA-06-0075-81-1) Avail: NTIS HC A08/MF A01 CSCL 13F

Track circuit signalling systems and different modes of possible electromagnetic interference from onboard electrical power subsystems for urban rail vehicles are described. Chopper controlled ac drives and inverter controlled ac drives are analyzed and characterized as electromagnetic noise sources. Wave forms of currents through various reactors in the drive circuitry are presented. Eleven different chopper circuit configuration are analyzed and the characteristics of multiple car trains are reviewed. GRA

88 SPACE SCIENCES (GENERAL)

No abstracts in this category.

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N82-10965 Polytechnic Inst. of New York, Brooklyn.
THE ANALYSIS OF STEAM IN MIRA STARS Ph.D. Thesis
Lewis L. Smith 1981 224 p
Avail: Univ. Microfilms Order No. 8118899

The analysis is treated using model atmospheres and radiative transfer theory to predict the line by line flux of H2O in the spectral region 4400-4500 cm. The H2O lines are quite weak in this region, hence, are unsaturated in the stellar atmosphere. The resulting computed spectra were to spectroscopic observations from the ground and high altitude aircraft for three stars--R Aql, Mira, and R Cas. Abundances of H2O and effective temperature Te were determined as a function of the phase of the visible light cycle. The radial velocity measurements of H2O and also CO and OH provide information on the infrared molecular forming regions of these stars. Dissert. Abstr.

N82-10966*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DOCUMENTATION FOR THE MACHINE-READABLE VERSION OF THE 0.2-A RESOLUTION FAR-ULTRAVIOLET STELLAR SPECTRA MEASURED WITH COPERNICUS
William T. Sheridan and Wayne H. Warren, Jr. Sep. 1981 10 p ref
(NASA-TM-84027; NSSDC/WDC-A-R&D-81-12) Avail: NTIS HC A02/MF A01 CSCL 03A

The spectra described represent a subset comprising data for 60 O- and B-type stars. The tape contains data in the spectral region lamda lamda 1000-1450 A with a resolution of 0.2 A. The magnetic tape version of the data is described. T.M.

N82-10967*# California Univ., Berkeley. Dept. of Physics.
HIGH SPECTRAL AND SPATIAL RESOLUTION OBSERVATIONS OF THE 12.28 MICRON EMISSION FROM H2 IN THE ORION MOLECULAR CLOUD
S. C. Beck, E. E. Bloemhof, E. Serabyn, C. H. Townes, A. T. Tokunaga (Hawaii Univ., Honolulu), J. H. Lacy (California Inst. of Technol., Pasadena), and H. A. Smith (NRL, Washington, D.C.) [1981] 14 p refs
(Grant NGL-05-003-272)
(NASA-CR-164889) Avail: NTIS HC A02/MF A01 CSCL 03A

The pure rotational S(2) line of molecular hydrogen at 12.28 microns was looked for in 44 positions in the Orion moleular cloud with 6 in. beams and 35 km/s spectral resolution; it was detected in 27 positions. Emission was observed over a velocity range of + or - 100 km/s. The lines are approximately symmetric, and have full widths at half maximum ranging from 100 km/s down to the resolution limit. The distribution of intensities and line shapes is largely consistent with that seen in the 2 micron hydrogen transitions. However, unexpectedly complex line profiles and point-to-point variations in linear shapes appear, particularly in the region near IRc9. J.M.S.

N82-10968 California Inst. of Tech., Pasadena.
THE ORIGIN OF THE KIRKWOOD GAPS: A MAPPING FOR ASTEROIDAL MOTION NEAR THE 3/1 COMMENSURABILITY 1. THE RESONANCE OVERLAP CRITERION AND THE ONSET OF STOCHASTIC BEHAVIOR IN THE RESTRICTED THREE-BODY PROBLEM 2. Ph.D. Thesis
Jack Leach Wisdom 1981 73 p
Avail: Univ. Microfilms Order No. 8118609

A mapping of the phase space onto itself with the same low order resonance structure as the 3/1 commensurability in the planar elliptic three-body problem is derived. This mapping is approximately one thousand times faster than the usual method of numerically integrating the averaged equations of motion. This mapping exhibits some behavior that might provide the key to the origin of the gaps. Also the resonance overlap criterion for the onset of stochastic behavior is applied to the planar circular-restricted three-body problem with small mass ratio (mu). Its predictions for mu = 0.001, 0.0001, and 0.00001 are compared to the transitions in the numerically determined Kolmogorov-Sinai entropy and found to be in remarkably good agreement. In addition, an approximate scaling law for the onset of stochastic behavior is derived. Dissert. Abstr

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N82-10969*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A NEW VIEW OF BARYON SYMMETRIC COSMOLOGY BASED ON GRAND UNIFIED THEORIES
F. W. Stecker Sep. 1981 23 p refs Presented at Oxford Intern. Symp. on Progress in Cosmology, England, Sep. 1981 Submitted for publication
(NASA-TM-83828) Avail: NTIS HC A02/MF A01 CSCL 03B

Within the framework of grand unified theories, it is shown how spontaneous CP violation leads to a domain structure in the universe with the domains evolving into separate regions of matter and antimatter excesses. Subsequent to exponential horizon growth, this can result in a universe of matter galaxies and antimatter galaxies. Various astrophysical data appear to favor this form of big bang cosmology. Future direct tests for cosmologically significant antimatter are discussed. A.R.H.

N82-10970# Los Alamos Scientific Lab., N. Mex.
RADIATIVE TRANSFER APPROXIMATIONS IN STELLAR PULSATION THEORY
C. G. Davis Aug. 1981 26 p refs
(Contract W-7405-eng-36)
(DE81-030513; LA-8931-MS) Avail: NTIS HC A03/MF A01

Pulsation theory is discussed in light of recent improvements in the theory of radiative transfer and hydrodynamics with applications to Cepheids, RR Lyrae, and W Virginis stars. It is concluded that the variable Eddington method is computational fast and a complete transfer approximation can be obtained. DOE

N82-10971 California Inst. of Tech., Pasadena.
NUCLEAR WEAK INTERACTION RATES DURING STELLAR EVOLUTION AND COLLAPSE Ph.D. Thesis
George Michael Fuller 1981 287 p
Avail: Univ. Microfilms Order No. 8118603

Nuclear weak interaction rates including electron and positron emission rates, and continuum electron and positron capture rates, as well as the associated Nu and bar nu energy loss rates are calculated on a detailed grid of temperature and density for the free nucleons and 226 nuclei with masses between A = 21 and 60. Gamow-Teller and Fermi discrete state transition matrix element systematics and the Gamow-Teller resonance transitions are discussed and are implemented in the stellar rate calculations. Results are presented on an abbreviated grid of temperature and density and compared where possible to terrestrial weak transition rates. Neutron shell blocking of allowed electron capture on heavy nuclei during stellar core collapse is discussed along with several unblocking mechanisms operative at high temperature and density. The results of one-zone collapse calculations suggest that the effect of neutron shell blocking is to produce a large core lepton fraction at neutrino trapping which leads to a larger inner core mass and hence a stronger post bounce shock. Dissert. Abstr.

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights.

For spacecraft design see *18 Spacecraft Design Testing, and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

N82-10972*# Planetary Science Inst., Pasadena, Calif. Planetary Science Inst.
PLANETARY RADAR STUDIES Final Report
T. W. Thompson and J. A. Cutts 30 Apr. 1981 157 p refs
(Contract NASw-3383; NSR-09-051-001)
(NASA-CR-164784; SAI-1-142-078-S1) Avail: NTIS HC A08/MF A01 CSCL 03B

A catalog of lunar and radar anomalies was generated to provide a base for comparison with Venusian radar signatures. The relationships between lunar radar anomalies and regolith processes were investigated, and a consortium was formed to compare lunar and Venusian radar images of craters. Time was scheduled at the Arecibo Observatory to use the 430 MHz radar to obtain high resolution radar maps of six areas of the lunar suface. Data from 1978 observations of Mare Serenitas and Plato are being analyzed on a PDP 11/70 computer to construct the computer program library necessary for the eventual reduction of the May 1981 and subsequent data acquisitions. Papers accepted for publication are presented. A.R.H.

N82-10973*# Planetary Science Inst., Pasadena, Calif.
PLANETARY RADAR STUDIES Quarterly Progress Report
T. W. Thompson and J. A. Cutts 15 Aug. 1981 126 p refs
(Contract NASw-3383)
(NASA-CR-164615; SAI-1-142-08-078-00) Avail: NTIS HC A07/MF A01 CSCL 03B

Progress made in studying the evolution of Venusian craters and the evolution of infrared and radar signatures of lunar crater interiors is reported. Comparison of radar images of craters on Venus and the Moon present evidence for a steady state Venus crater population. Successful observations at the Arecibo Observatory yielded good data on five nights when data for a mix of inner and limb areas were acquired. Lunar craters with radar bright ejects are discussed. An overview of infrared radar crater catalogs in the data base is included. A.R.H.

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N82-10974 New Mexico State Univ., Las Cruces.
THE APPLICABILITY OF THE FOURIER CONVOLUTION THEOREM TO THE ANALYSIS OF LATE-TYPE STELLAR SPECTRA Ph.D. Thesis
David Hall Bruning 1981 140 p
Avail: Univ. Microfilms Order No. 8119219

Solar flux and intensity measurements, to test the validity of the Fourier convolution method as a means of analyzing the spectral line shapes of late-type stars, shows that, in general, the convolution method is not a suitable approximation for the calculation of the flux profile. Explicit disk integrations are promoted as the only reliable method spectral line analysis for late-type stars. Several methods of performing the disk integration are investigated. Center-to-limb variations of line depth and shape are considered for the modification of the rotational broadening functin used in the convolution. It is shown that central depth variations alone mimic limb-darkening and do not effectively change the shape of the line broadening function, thus leading to the failure of this simple modification to reproduce observed line shapes. Stylized line shape variations are used to demonstrate why the convolution method works for fast rotators like A-type stars but not for the slow rotators like the Sun. Dissert. Abstr.

N82-10975*# Stanford Univ., Calif. Inst. for Plasma Research.
TEMPERATURE MINIMUM HEATING IN SOLAR FLARES BY RESISTIVE DISSIPATION OF ALFVEN WAVES
A Gordon Emslie and P. A. Sturrock Aug. 1981 23 p refs (Grants NGL-05-020-272; NAGw-92; Contract N00014-75-C-0673)
(SU-SUIPR-856; NASA-CR-164900) Avail: NTIS HC A02/MF A01 CSCL 03B

The possibility that the strong heating produced at temperature-minimum levels during solar flares is due to resistive dissipation of Alfven waves generated by the primary energy release process in the corona is studied. It is shown how, for suitable parameters, these waves can carry their energy essentially undamped into the temperature-minimum layers and can then produce a degree of heating consistent with observations. S.L.

N82-10976 California Inst. of Tech., Pasadena.
ELEMENTAL COMPOSITION OF SOLAR ENERGETIC PARTICLES Ph.D. Thesis
Walter Richardson Cook, III 1981 182 p
Avail: Univ. Microfilms Order No. 8118975

The low energy telescope on the Voyager spacecraft was used to measure the elemental composition and energy spectra of solar energetic particles (SEPs) in seven large flare events. Four flare events are selected which have SEP abundance ratios approximately independent of energy/nucleon. The abundances for these vents are compared from flare to flare and are compared to solar abundances from othe sources: spectroscopy of the photosphere and corona, and solar wind measurements. The four flare average SEP composition is significantly different from the solar composition determined by photospheric spectroscopy but is in agreement with solar wind abundance results and with a number of recent coronal abundance measurements. The evidence for a common depletion of oxygen in SEPs, the corona and the solar wind relative to the photosphere suggests that the SEPs originate in the corona and that both the SEPs and solar wind sample a coronal composition which is significantly and persistently different from that of the photosphere. Dissert. Abstr.

N82-10066*# Scientific Analysts and Consultants, Inc., Rockville, Md.
A GENERAL METHOD FOR COMPUTING THE TOTAL SOLAR RADIATION FORCE ON COMPLEX SPACECRAFT STRUCTURES
F. K. Chan *In* NASA. Goddard Space Flight Center Sixth Ann. Flight Mech./Estimation Theory Symp. Oct. 1981 12 p refs (For primary document see N82-10064 01-12)
Avail: NTIS HC A13/MF A01 CSCL 03B

N82-10067*# Computer Sciences Corp., Silver Spring, Md.
SOLAR RADIATION FORCE MODELING FOR TDRS ORBIT DETERMINATION
Taesul Lee, Michael J. Lucas, and Robert E. Shanklin, Jr. *In* NASA. Goddard Space Flight Center Sixth Ann. Flight Mech./Estimation Theory Symp. Oct. 1981 25 p refs (For primary document see N82-10064 01-12)
(Contract NAS5-24300)
Avail: NTIS HC A13/MF A01 CSCL 03B

93 SPACE RADIATION

Includes cosmic radiation and inner and outer earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N82-10977 California Inst. of Tech., Pasadena.
STUDIES OF COMPACT EXTRAGALACTIC RADIO SOURCES Ph.D. Thesis
Roger Paul Linfield 1981 68 p
Avail: Univ. Microfilms Order No. 8118918

Very long base interferometry maps are presented of the nuclear cores of four radio galaxies which have large symmetric radio lobes: 3C111, 3C390.3, Cyg A, and 0055 + 30. Each source contains a nuclear jet having a scale of 1 pc, but no counterjets are seen. The jets in 3C111 and 0055 + 30 point directly at the outer radio lobes, but in 3C390.3 and Cyg A the jets are pointed from 4 to 6 degrees away from the lobes. In all four cases, the observed asymmetry reflects an intrinsic asymmetry on a msec scale. The minimum pressure in the four jets is calculated, and it is concluded that the jet in Cyg A is very unlikely to be confined by gas pressure. An attempt is made to explain the structure of compact radio sources with a precession like motion of a relativistic jet. It is found that the curvature of these sources can be readily explained in this way. In addition, the knots which are often revealed by VLBI observations arise naturally in such a model. Dissert. Abstr.

99 GENERAL

N82-10978# Council for Scientific and Industrial Research, Pretoria (South Africa). Publishing Div.
CSIR: COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH, Annual Report
1 May 1981 74 p Original contains color illustrations
(CSIR-36; ISBN-0-7988-2069-1; ISSSN-0370-8454) Avail: NTIS HC A04/MF A01

Research conducted and technologies developed to improve industrial processes and better utilize natural resources of the Republic of South Africa are described. International cooperation in meteorology, the use of remote sensing and advances in medical science, materials science, astronomy, and electronics are among the 42 areas of study summarized. A.R.H.

N82-10979# Office of Naval Research, San Francisco, Calif. Scientific Liaison Group.
ONR TOKYO SCIENTIFIC BULLETIN, VOLUME 6, NUMBER 2, APRIL-JUNE 1981
Young B. Kim and Mary Lou Moore Jun. 1981 136 p
(AD-A103321) Avail: NTIS HC A07/MF A01 CSCL 05/2

Contents: National Research Institute for Metals Revisited; Fresh Winds in the Land of Morning Calm; First Asian Congress on Fluid Mechanics; Nuclear Magnetic Resonance (NMR) Imaging in Japan; 1980 Annual Meeting of the Institute of Electrostatics in Japan; U.S.-Japan Seminar: Measurement and Control of Particulates Generated from Human Activities; Fifth International Acoustic Emission Symposium; Japan-United States Conference on Composite Materials Mechanics, Mechanical Properties, and Fabrication; XI International Conference on Defects and Radiation Effects on Semiconductors; Fifth International Symposium on Air Breathing Engines; The First China-Japan-U.S.A. Seminar on Organometallic Chemistry; International Meetings in the Far East 1980-1981; and Chemistry in Japan Today: An Interview with O. Hayaishi and M. Mukooyama. GRA

N82-10980# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
RECENT SELECTED PAPERS OF NORTHWESTERN POLYTECHNICAL UNIVERSITY, PART 1
20 Aug. 1981 381 p refs Transl. into ENGLISH from Recent Selected Papers of NW Polytech. Univ., pt. 1 (Xian Shaanxi), 1979 p 1-3, 1-4, 1-25, 27-35, 37-49, 51-105, and 107-200 2 Vol.
(FTD-ID(RS)T-0259-81-Pt-1) Avail: NTIS HC A17/MF A01

Methods and techniques used in aeronautical engineering and structural design are presented. The aerodynamics of airfoils and the prediction of flow distribution associated with them are discussed. Structural analysis methods such as matrix methods and finite element methods were reviewed. Emphasis is placed on fracture mechanics and the study of crack initiation in structural members and machine parts. For individual titles, see N82-10981 through N82-10995.

N82-10981# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
FINITE DIFFERENCE COMPUTATION OF THE STEADY TRANSONIC POTENTIAL FLOW AROUND AIRPLANES c02
Luo Shijun, Zheng Yuwen, Qian Hong, and Wang Dieqian *In its* Recent Selected Papers of NW Polytech. Univ., pt. 1 (FTD-ID(RS)T-0259-81-Pt-1) 20 Aug. 1981 p 5-30 refs Transl. into ENGLISH from Recent Selected Papers of NW Polytech. Univ., pt. 1 (Xian Shaanxi), 1979 (For primary document see N82-10980 01-99)
Avail: NTIS HC A17/MF A01

The velocity potential equation was approximated by assuming that the perturbation velocity component in the transverse plane of the body is much smaller than the undistributed flow velocity, while the perturbation velocity component in the longitudinal direction may not be so. It was then solved with mixed schemes of finite differences. The boundary condition on wings (tails) and its wake were approximated similarly. Two numerical examples

are included and the results agree well with known wind tunnel test results. T.M.

N82-10982# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SECOND ORDER APPROXIMATION THEORY OF AN ARBITRARY AEROFOIL IN COMPRESSIBLE POTENTIAL FLOW c02
Lin Chaoqiang *In its* Recent Selected Papers of NW Polytech. Univ., pt. 1 (FTD-ID(RS)T-0259-81-Pt-1) 20 Aug. 1981 p 31-50 refs Transl. into ENGLISH from Recent Selected Papers of NW Polytech. Univ., pt. 1 (Xian Shaanxi), 1979 (For primary document see N82-10980 01-99)
Avail: NTIS HC A17/MF A01

The region outside an arbitrary airfoil is conformally transformed into the region outside a unit circle. The transformation functions are expanded into ascending power series and then only those terms up to and including the second order are retained. The resulting formulae are given analytically. The method is nearly an exact solution from the engineering point of view, even for an airfoil with thickness as much as 30 percent of the chord and with maximum camber as much as 10 percent of the chord. T.M.

N82-10983# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
AERODYNAMIC CALCULATIONS AND DESIGN OF SUBCRITICAL AEROFOILS c02
Lin Chaoqiang *In its* Recent Selected Papers of NW Polytech. Univ., pt. 1 (FTD-ID(RS)T-0259-81-Pt-1) 20 Aug. 1981 p 51-64 refs Transl. into ENGLISH from Recent Selected Papers of NW Polytech. Univ., pt. 1 (Xian Shaanxi), 1979 (For primary document see N82-10980 01-99)
Avail: NTIS HC A17/MF A01

A method of calculating the velocity and pressure distribution on an airfoil of given geometrical profile at a given angle of attack in subcritical potential flow is described. Inversely, designing appropriate airfoil geometry and the corresponding angle of attack for a given pressure distribution is discussed. T.M.

N82-10984# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
AN AERODYNAMIC DESIGN METHOD FOR TRANSONIC AXIAL FLOW COMPRESSOR STAGE c07
Zhu Fangynan, Zhou Xinhai, Liu Songling, and Fan Feida *In its* Recent Selected Papers of NW Polytech. Univ., pt. 1 (FTD-ID(RS)T-0259-81-Pt-1) 20 Aug. 1981 p 65-86 refs Transl. into ENGLISH from Recent Selected Papers of NW Polytech. Univ., pt. 1 (Xian Shaanxi), 1979 (For primary document see N82-10980 01-99)
Avail: NTIS HC A17/MF A01

The method is comprised of three main parts: the mean S sub 2 streamsurface calculation, the approximate calculation of S sub 1 streamsurface of revolution, and defining the blade element on the conical surface and stacking the blade airfoil sections. The method is unusual in that the calculation stations for making the S sub 2 streamsurface computations are curves, and particularly in that the airfoil parameters of blade are calculated on a plane tangent to the approximate streamsurface of revolution. On this tangential plane, two dimensional flow is used as basic model to calculate the Mach wave system on the suction surface of cascade entrance region. T.M.

N82-10985# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ANALYTICAL AND EXPERIMENTAL INVESTIGATION OF PERFORMANCE OF SUPERSONIC EJECTOR NOZZLE c34
Shen Huili and Chen Zhongqing *In its* Recent Selected Papers of NW Polytech. Univ., pt. 1 (FTD-ID(RS)T-0259-81-Pt-1) 20 Aug. 1981 p 87-109 refs Transl. into ENGLISH from Recent Selected Papers of NW Polytech. Univ., pt. 1 (Xian Shaanxi), 1979 (For primary document see N82-10980 01-99)
Avail: NTIS HC A17/MF A01

The calculations involve the real sonic line at the exit of the primary nozzle, the inviscid primary flow field, the correction for viscosity effect and the pumping, and thrust characteristics. In order to bring calculated results into agreement with experimental data, the real sonic line, instead of the plane sonic line, is taken as the initial base line of calculations. The real sonic line is obtained by joining the points of intersection of constant flow angle lines in the throat region with Mach lines at the lip of the primary nozzle. First, the inviscid primary flow field of the nozzle is calculated and then corrected to account for the viscosity effect. On the basis of the corrected coordinates, the actual primary flow field and pumping performance of the nozzle are then calculated. The proposed method proves to be quite simple and accurate. T.M.

N82-10986# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
AN OPTIMUM DESIGN PROCEDURE OF TOTAL-TEMPERATURE THERMOCOUPLE PROBE c35
Liu Cihong and Zhao Jue-liang *In its* Recent Selected Papers of NW Polytech. Univ., pt. 1 (FTD-ID(RS)T-0259-81-Pt-1) 20 Aug. 1981 p 110-131 refs Transl. into ENGLISH from Recent Selected Papers of NW Polytech. Univ., pt. (Xian Shaanxi), 1979 (For primary document see N82-10980 01-99)
Avail: NTIS HC A17/MF A01

The gas velocity in the sheath or the optimum internal flow velocity was determined on the principle that the Sun of the radiation error, the conduction error and the velocity error is a minimum under given operating conditions. After determining the optimum internal flow velocity, the diameter of the exhaust hole was determined and the layout of the probe was designed. The programming of the optimum design of total-temperature thermocouple probes, the formula for manually estimating the appropriate optimum internal flow velocity, and the design procedure are presented. T.M.

N82-10987# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
A SYNTHESIS TECHNIQUE FOR ARRAY ANTENNAS OF HIGH DIRECTIVITY AND LOW SIDELOBE c32
Wan Wei, Huang Jingxi, and Hu Shiming *In its* Recent Selected Papers of NW Polytech. Univ., pt. 1 (FTD-ID(RS)T-0259-81-Pt-1) 20 Aug. 1981 p 132-155 refs Transl. into ENGLISH from Recent Selected Papers of NW Polytech. Univ., pt. 1 (Xian Shaanxi), 1979 (For primary document see N82-10980 01-99)
Avail: NTIS HC A17/MF A01

Two techniques were reviewed with a view towards finding a synthesis optimization technique that is applicable to the simultaneous consideration of two or more performance indices. These performance indices include: the directivity and/or signal to noise ration, efficiency, sidelobe level, and the questions of null and maximum sidelobe. T.M.

N82-10988# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
MODEL METHOD OF STATE ESTIMATION c63
Dai Guanzhong *In its* Recent Selected Papers of NW Polytech. Univ., pt. 1 (FTD-ID(RS)T-0259-81-Pt-1) 20 Aug. 1981 p 156-190 refs Transl. into ENGLISH from Recent Selected Papers of NW Polytech. Univ., pt. 1 (Xian Shaanxi), 1979 (For primary document see N82-10980 01-99)
Avail: NTIS HC A17/MF A01

The problem of estimating the state of a stochastic dynamical system from noisemixed observed values taken from the state is of central importance in modern control theory. In accordance with the relationships of correspondence between the dynamical systems (original) and the filters (model), a unified and direct approach to derive the recursive equations for discrete time and continuous time. Linear and nonlinear, unbiased and minimum variance filters is presented. For the nonlinear sytems only the second order approximation suboptima filters were studied. T.M.

N82-10989# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SOLIDIFICATION CHARACTERISTICS OF SUPERALLOYS UNDER NONEQUILIBRIUM CONDITION c26
Fu Hengzhi *In its* Recent Selected Papers of NW Polytech. Univ., pt. 1 (FTD-ID(RS)T-0259-81-Pt-1) 20 Aug. 1981 p 191-219 refs Transl. into ENGLISH from Recent Selected Papers of NW Polytech. Univ., pt. 1 (Xiam Shaanxi), 1979 (For primary document see N82-10980 01-99)
Avail: NTIS HC A17/MF A01

The effect of the solute distribution coefficient on the

crystallization process under nonequilibrium conditions is discussed. The effect of adding alloying elements for additional strength on the cooling curve and crystallization characteristics was investigated. T.M.

N82-10990# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE PLASTIC DEFORMATION, MICRO-CRACK INITIATION AND FATIGUE CRACK INITIATION LIFE OF 30CrMnSiNi2A HIGH STRENGTH MARTENSITE STEEL c26
Zheng Xiulin and Qiao Shengru *In its* Recent Selected Papers of NW Polytech. Univ., pt. 1 (FTD-ID(RS)T-0259-81-Pt-1) 20 Aug. 1981 p 220-238 refs Transl. into ENGLISH from Recent Selected Papers of NW Polytech. Univ., pt. 1 (Xian Shaanxi), 1979 (For primary document see N82-10980 01-99)
Avail: NTIS HC A17/MF A01

The analysis was carried out using electron microscopy, optical microscopy, and impact fatigue machines. Results show that lathy Martensite is the predominating structure of 30CrMnSiNi2A steel when oil quenched and martempered. It is found that, on the polished surfaces of test pieces, the so-called deformation reliefs appear in the plastic zone around the tip of the fatigue crack. Both the orientation and the size of the deformation reliefs correspond exactly with those of the Martensite laths. T.M.

N82-10991# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE COMPUTATION OF INTEGRAL TYPE FLEXURE HINGE ASSEMBLY OF DYNAMICALLY TUNED GYROSCOPES c35
Mei Shuo-ji *In its* Recent Selected Papers of NW Polytech. Univ., pt. 1 (FTD-ID(RS)T-0259-81-Pt-1) 20 Aug. 1981 p 239-270 refs Transl. into ENGLISH from Recent Selected Papers of NW Polytech. Univ., pt. 1 (Xian Shaanxi), 1979 (For primary document see N82-10980 01-99)
Avail: NTIS HC A17/MF A01

In order to satisfy the requirements of gyroscopic tuning, the degree of the angular displacement stiffness which is designed into the piece of equipment must have a high degree of accuracy. In order to eliminate the error associated with g(2) drift, the axial stiffness and the radial stiffness of the hinge assembly of the gyroscopes being considered should be equal. Design methods for such hinge assemblies are discussed. T.M.

N82-10992# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
A THEORETICAL ANALYSIS OF INVOLUTE HARMONIC GEARING c37
Shen Yunwen *In its* Recent Selected Papers of NW Polytech. Univ., pt. 1 (FTD-ID(RS)T-0259-81-Pt-1) 20 Aug. 1981 p 271-314 refs Transl. into ENGLISH from Recent Selected Papers of NW Polytech. Univ., pt. 1 (Xian Shaanxi), 1979 (For primary document see N82-10980 01-99)
Avail: NTIS HC A17/MF A01

The influence of errors in the theoretical profiling of gears was studied. A theoretical demonstration of the feasibility of using involute gearing profiles to replace theoretical gearing profiles is presented. Conditions in which transmission will not give rise to interference are presented and optimization techniques are used as part of practical method for solving the problem of controlling side cracking. T.M.

N82-10993# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
A METHOD OF EVALUATION OF THE TORSIONAL RIGIDITY AND THE THIRD STRESS INTENSITY FACTOR OF PRISMATICAL BAR OF RECTANGULAR CROSS SECTION WITH CRACKS c39
Chen Yizhou *In its* Recent Selected Papers of NW Polytech. Univ., pt. 1 (FTD-ID(RS)T-0259-81-Pt-1) 20 Aug. 1981 p 315-337 refs Transl. into ENGLISH from Recent Selected Papers of NW Polytech. Univ., pt. 1 (Xian Shaanxi), 1979 (For primary document see N82-10980 01-99)
Avail: NTIS HC A17/MF A01

Three cases are discussed: a single crack not originating from the center of the edges of the rectangular cross section; a single crack originating from the midpoint of one edge of the rectangular cross section; and two cracks of equal length originating from the midpoints of opposite edges of the rectangular cross section. Under these three conditions, the cracks are perpendicular to the edges of the cross section of the prismatic bar. T.M.

N82-10994# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE AUTOMATIC MATRIX FORCE METHOD AND TECHNIQUES FOR HANDLING MORE COMPLEX COMPUTATIONS WITH GIVEN COMPUTER CAPACITY c61
Yang Qingxiong *In its* Recent Selected Papers of NW Polytech. Univ., pt. 1 (FTD-ID(RS)T-0259-81-Pt-1) 20 Aug. 1981 p 338-358 refs Transl. into ENGLISH from Recent Selected Papers of NW Polytech. Univ., pt. 1 (Xian Shaanxi), 1979 (For primary document see N82-10980 01-99)
Avail: NTIS HC A17/MF A01

The history of using the method for structural computation in domestic aeronautical engineering was reviewed. The development and application of the matrix method was examined. T.M.

N82-10995# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
STRUCTURAL ANALYSIS OF FUSELAGES WITH CUTOUTS BY FINITE ELEMENT METHOD c39
G. Shoulian, Sun Can, Tang Xuunchun, and Ye Tiangi *In its* Recent Selected Papers of NW Polytech. Univ., pt. 1 (FTD-ID(RS)T-0259-81-Pt-1) 20 Aug. 1981 p 359-378 refs Transl. into ENGLISH from Recent Selected Papers of NW Polytech. Univ., pt. 1 (Xian Shaanxi), 1979 (For primary document see N82-10980 01-99)
Avail: NTIS HC A17/MF A01

The rear part of a transport aircraft's fuselage was studied. It consists of two sections, the front section being a closed cylinder with a floor and the other section containing a large cutout. An idealized structure is considered to have 1950 degrees of freedom. In this analysis, three kinds of finite element were adopted: a flange element with various cross sections; a constant shear flow quadrilateral of arbitrary shape; and a beam element of various cross sections taking account of eccentricity of the nodes from the axes of moment and inertia. A factorization algorithm was adopted in the solution of the system of linear algebraic equations. T.M.

N82-10996# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
RECENT SELECTED PAPERS OF NORTHWESTERN POLYTECHNICAL UNIVERSITY, PART 2
28 Aug. 1981 418 p refs Transl. into ENGLISH from Recent Selected Papers of NW Polytech. Univ., pt. 2 (Xian Shaanxi), 1979 p 1-137, 139-167, 169-185, 187-201, 203-215, and 217-240 2 Vol.
(FTD-ID(RS)T-0260-81-Pt-2) Avail: NTIS HC A18/MF A01

Relevant topics of significance to the aerospace industry are discussed. Included are: dynamic analysis of various aircraft structures; fuel combustion stability; and propulsion system performance. For individual titles, see N82-10997 through N82-11011.

N82-10997# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
DUAL PROPERTIES OF ELASTIC STRUCTURES c39
Chen Baiping *In its* Recent Selected Papers of NW Polytech. Univ., pt. 2 (FTD-ID(RS)T-0260-81-Pt-2) 28 Aug. 1981 p 1-75 refs Transl. into ENGLISH from Recent Selected Papers of NW Polytech. Univ., pt. 2 (Xian Shaanxi), 1979 (For primary document see N82-10996 01-99)
Avail: NTIS HC A18/MF A01

One, two, and three dimensional problems in the statistics of elastic bodies are considered with respect to their involvement with four function vectors. These include displacement, strain, stress, and distributed-load function vectors. R.C.T.

N82-10998# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
MATRIX ANALYSIS OF WINGS c05
Xu Yuan, Zhu Runziang, Jiang Jinqiag, and Cai Yiuliu *In its* Recent Selected Papers of NW Polytech. Univ., pt. 2 (FTD-ID(RS)

T-0260-81-Pt-2) 28 Aug. 1981 p 76-111 refs Transl. into ENGLISH from Recent Selected Papers of NW Polytech. Univ., pt. 2 (Xian Shaanxi), 1979 (For primary document see N82-10996 01-99)
Avail: NTIS HC A18/MF A01

The plate-beam wing constructions are simplified either as plane stress or plate bending models. The triangular element matrix of a laminated plate is introduced as well as the element stiffness matrix of the beam of axially variable rectangular cross section. Two general computer calculation programs are also compiled. Calculations are shown for wings consisting of plates and beams, honeycomb core and solid wings. Compared to the experimental results, the errors in the nodal deflections are generally less than 5%. It is clear that the method adopted has finite accuracy and generality. R.C.T.

N82-10999# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ON A METHOD FOR THE DETERMINATION OF PLANE STRESS FRACTURE TOUGHNESS K SUB c OF 30 CrMnSiNi2A STEEL AND SOME RELATED PROBLEMS **c39**
Cui Zhenyuan, Zheng Changqing, Shi Jize et al *In its* Recent Selected Papers of NW Polytech. Univ., pt. 2 (FTD-ID(RS)T-0260-81-Pt-2) 28 Aug. 1981 p 112-136 refs Transl. into ENGLISH from Recent Selected Papers of NW Polytech. Univ. pt. 2 (Xian Shaanxi), 1979 (For primary document see N82-10996 01-99)
Avail: NTIS HC A18/MF A01

The fracture toughness for various materials was determined. Some experimental results with 30CrMnSiNi2A steel are discussed and some of the key problems in the determination of fracture toughness using CCT samples as the test vehicle are discussed. R.C.T.

N82-11000# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE ISLAND STRUCTURE OF (M-A) IN HARDENED LOW-ALLOY HIGH-STRENGTH STEELS **c26**
Kang Mokuang, Guan Dunhui, Guo Chengdao, and Zhu Jinrong *In its* Recent Selected Papers of NW Polytech. Univ., pt. 2 (FTD-ID(RS)T-0260-81-Pt-2) 28 Aug. 1981 p 137-173 refs Transl. into ENGLISH from Recent Selected Papers of NW Polytech. Univ., pt. 2 (Xian Shaanxi), 1979 (For primary document see N82-10996 01-99)
Avail: NTIS HC A18/MF A01

The quenching of low alloy high strength steel was investigated in terms of isothermal quenching and direct quenching (which is continuous cooling in a medium such as water, oil, or air). Production results showed that neither quenching method can produce a uniform single structure. Island formed structure constituents exist in various quenched steels. R.C.T.

N82-11001# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
A STUDY ON INSULATED RISERS **c34**
Zhoe Yaohe, Zhang Yanwei, Qu Weitao, Lin Zaiue, Mao Zhiying, Wang Youxu, Niu Jingxin, and Zhang Qixn *In its* Recent Selected Papers of NW Polytech. Univ., pt. 2 (FTD-ID(RS)T-0260-81-Pt-2) 28 Aug. 1981 p 174-196 refs Transl. into ENGLISH from Recent Selected Papers of NW Polytech. Univ., pt. 2 (Xian Shaanxi), 1979 (For primary document see N82-10996 01-99)
Avail: NTIS HC A18/MF A01

The plate-shaped casting method was used to determine the thermal physical parameters of three insulating materials: pearlite; formed plaster; and ceramic wool together with a wet sand mode. From the freezing characteristics of sand castings, a calculation method was formulated to describe the insulated riser. Using the measured physical thermal coefficients, this method was verified on a pure aluminum cubic casting. Experimental and calculated results were consistent. Pearlite and formed plastic risers were seven times smaller than the conventional ones. A ceramic wool riser was found to be eight times smaller. A theoretical analysis of the effectiveness of the insulated risers was also conducted. R.C.T.

N82-11002# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE STUDY ON TECHNOLOGICAL FUNDAMENTALS OF PULSED SPRAY TRANSFER ARC WELDING (IV). OBSERVATIONS ON ARC PHENOMENA IN THE CASE OF STABLE WELDING CONDITION **c37**
Duan Liyu, Cheng Gongshou, Feng Jijiang, Wang Xuxi, and Lu Xuezhen *In its* Recent Selected Papers of NW Polytech. Univ., pt. 2 (FTD-ID(RS)T-0260-81-Pt-2) 28 Aug. 1981 p 197-236 refs Transl. into ENGLISH from Recent Selected Papers of NW Polytech. Univ., pt. 2 (Xian Shaanxi), 1979 (For primary document see N82-10996 01-99)
(Rept-1) Avail: NTIS HC A18/MF A01

The observations made on arc phenomena in the case of stable arc conditions of pulsed spray transfer arc welding are reported. A large quantity of high speed photographic pictures and synchronous oscillograms of the arc parameters are used as the basis for describing the arc phenomena. The major focus is on arc forming, droplet transfer, and sputter at representative test condition points. Efforts are also made to describe the droplet transfer-back problem in a pulsed arc. R.C.T.

N82-11003# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
A FAST FOURIER TRANSFORM HARDWARE PROCESSOR **c37**
Kang Ji-Chang and Xu Naiping *In its* Recent Selected Papers of NW Polytech. Univ., pt. 2 (FTD-ID(RS)T-0260-PT-2) 28 Aug. 1981 p 237-252 refs Transl. into ENGLISH from Recent Selected Papers of NW Polytech. Univ., pt. 2 (Xian Shaanxi), 1979 (For primary document see N82-10996 01-99)
Avail: NTIS HC A18/MF A01

A real time fast Fourier transformation processor was developed to analyze acoustic frequency signals. The analysis time for the 1024 frequency spectrum points was approximately 40 ms. A different approach in the development of this processor is proposed in order to simplify the original design. With this modified approach, the size of the CPU and memory can be reduced by about one-half. The design concepts and main circuits in the approach are introduced. R.C.T.

N82-11004# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
COLOR DISCRIMINATION BY A COLOR-PICTURE READER **c74**
Chen Chenghang *In its* Recent Selected Papers of NW Polytech. Univ., pt. 2 (FTD-ID(RS)T-0260-81-Pt-2) 28 Aug. 1981 p 253-272 refs Transl. into ENGLISH from Recent Selected Papers of NW Polytech. Univ., pt. 2 (Xian Shaanxi), 1979 (For primary document see N82-10996 01-99)
Avail: NTIS HC A18/MF A01

An outline is given of a convenient process for color discrimination which identifies the hue, purity, and brightness of a color. Simple circuits are developed to separate twelve colors and produce the color code output for each color directly. Results are presented which confirm the stability and reliability of the process for color discrimination. R.C.T.

N82-11005# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ON THE UNIQUENESS OF THE SOLUTION TO THE VELOCITY POTENTIAL INTEGRAL EQUATION ESTABLISHED BY USING GREEN'S THEOREM **c64**
Liu Qiangang *In its* Recent Selected Papers of NW Polytech. Univ., pt. 2 (FTD-ID(RS)T-0260-81-Pt-2) 28 Aug. 1981 p 273-286 refs Transl. into ENGLISH from Recent Selected Papers of NW Polytech. Univ., pt. 2 (Xian Shaanxi), 1979 (For primary document see N82-10996 01-99)
Avail: NTIS HC A18/MF A01

The Green theorem was used in conjunction with the singularity method to solve the potential flow problem around an object. The major focus was on gas dynamic numerical computation to establish the distribution of singularities on the surface of an object. R.C.T.

N82-11006# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
INITIAL EXPERIMENTAL RESEARCH INTO THE RESPONSE OF TURBOJET ENGINE COMPRESSORS TO DISTORTION OF INTAKE PRESSURE **c07**
Chen Fu-qun, Tang Di-yi, Hu Zi-long, Id Wen-lan, Yu Jin-di, Wu

Xin-yuan, Zhao Jue-liang, Lin Qi-xun, Wang Zong-yuan, Liu Si-hong et al *In its* Recent Selected Papers of NW Polytech. Univ., pt. 2 (FTD-ID(RS)T-0260-81-Pt-2) 28 Aug. 1981 p 287-316 refs Transl. into ENGLISH from Recent Selected Papers of NW Polytech. Univ., pt. 2 (Xian Shaanxi), 1979 (For primary document see N82-10996 01-99)
Avail: NTIS HC A18/MF A01

The influence which distorations in intake pressure have on the stability and characteristics of the compressors of turbojet engines was investigated. The test bed of a turbojet engines with a nine stage compressor was used as a test bed. The first stage of the compressor was transonic. It was concluded that the capabilities of compressors of this type of turbojet engine are not only determined by the capabilities or characteristics of the compressor but also by the structural arrangement and actual situation of the other components in system of the compressor. Other significant conclusions are reported. R.C.T.

N82-11007# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
A PRELIMINARY EXPERIMENTAL INVESTIGATION OF THE RESPONSE OF A TURBOJET ENGINE TO INLET PRESSURE DISTORTION c07
Chen Fu-qun, Tang Di-yi, Hu Zi-long, Id Wen-lan, Yu Jin-di, Wu Xin-yuan, Zhao Jue-liang, Lin Qi-xun, Wang Zong-yuan, and Liu Si-hong *In its* Recent Selected Papers of NW Polytech. Univ., pt. 2 (FTD-ID(RS)T-0260-81-Pt-2) 28 Aug. 1981 p 317-346 refs Transl. into ENGLISH from Recent Selected Papers of NW Polytech. Univ., pt. 2 (Xian Shaanxi), 1979 (For primary document see N82-10996 01-99)
Avail: NTIS HC A18/MF A01

Preliminary experimental results about the effect of inlet pressure distortion on the characteristics and instability of the axial compressor of a turbojet engine are presented. The experiments were conducted on the test bed on a turbojet engine with a 9-stage compressor, whose first stage is transonic. The tests were run for each of the following cases: (1) at 99% design speed with 180 deg triple-deck 36 mesh screen in front of the engine inlet, i.e., 3x36 mesh; (2) at 90% design speed with 180 deg single-deck 35 mesh screen, i.e., 1x36 mesh; (3) at 90% design speed with clean inlet; and (4) at 87% design speed with a decrease of about 12% of the first stage turbine nozzle exit area. R.C.T.

N82-11008# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
AN EXPERIMENTAL INVESTIGATION OF THE ROTATING STALL, SURGE AND WAKE BEHIND THE ROTOR FOR A SINGLE STAGE AXIAL COMPRESSOR c07
Zhang Weide, Zbang Changsheng, Liu Zhiwei, and Liu Jiafeng *In its* Recent Selected Papers of NW Polytech. Univ., pt. 2 (FTD-ID(RS)T-0260-81-Pt-2) 28 Aug. 1981 p 347-370 refs Transl. into ENGLISH from Recent Selected Papers of NW Polytech. Univ., pt. 2 (Xian Shaanxi), 1979 (For primary document see N82-10996 01-99)
Avail: NTIS HC A18/MF A01

Dynamic tests were conducted in order to investigate the rotating stall, surge, and wake behind the rotor of a single stage axial compressor. The relationship between the rotating stall and the total turbulence behind the rotor caused by the wake was also studied. It was found that the waveform of the wake behind the rotor shows marked changes when rotating stall approaches. The wake induced degree of total turbulence increases sharply, and therefore may be used as a way to predict rotating stall. The total process of rotating stall and surge as well as the differences between the two and their connection were also compared. R.C.T.

N82-11009# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
EXPERIMENTAL INVESTIGATION OF A VAPORIZING COMBUSTION WITH DOUBLE COMBUSTION SPACES c25
In its Recent Selected Papers of NW Polytech. Univ., pt. 2 (FTD-ID(RS)T-0260-81-Pt-2) 28 Aug. 1981 p 371-387 refs Transl. into ENGLISH from Recent Selected Papers of NW Polytech. Univ., pt. 2 (Xian Shaanxi), 1979 (For primary document see N82-10996 01-99)
Avail: NTIS HC A18/MF A01

The special design features of the prevaporizing installation in the head section of and the combustion chamber are introduced. The combustor is to be used in a high temperature, hot wind tunnel to provide a steady uniform hot gas stream. R.C.T.

N82-11010# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
A VAPORIZING COMBUSTOR WITH DOUBLE COMBUSTION SPACES c25
Tang Ming, Zhu Huiling, and Du Qinfang *In its* Recent Selected Papers of NW Polytech. Univ., pt. 2 (FTD-ID(RS)T-0260-81-Pt-2) 28 Aug. 1981 p 388-411 refs Transl. into ENGLISH from Recent Selected Papers of NW Polytech. Univ., pt. 2 (Xian Shaanxi), 1979 (For primary document see N82-10996 01-99)
Avail: NTIS HC A18/MF A01

A tubular combustor with a novel type of prevaporizing tube, which is of annular cross-section was examined. The dome of the combustor was divided into two combustion spaces. Fuel was injected under moderate pressure into the annular space of the prevaporizing tube, through the orifices on the two fuel distribution rings. The combustor was designed to be used as an air heater for the test setup of a hot wind tunnel. It was required that the combustor furnish a steady uniform hot gas stream at a temperature of 400-1100 C and that the flame should not extend beyond the exit of the flame tube. A lean fuel-air mixture with an excess-air coefficient of nearly unit was adopted in the design of the prevaporizing tube. This required the entrance area of the air to be prevaporized to make up about 30% of the total air entrance area. Air film cooling technique was adopted by using corrugated strips to form a number of cooling slots. The area of the cooling slots was selected to be about 20% of the total air entrance area. It was found that the cooling effect is satisfactory. Author

N82-11011# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE ACOUSTIC INSTABILITY OF COMBUSTION IN SOLID PROPELLANT ROCKET MOTORS WITH TUBULAR GRAIN c20
Wu Xinping *In its* Recent Selected Papers of NW Polytech. Univ., pt. 2 (FTD-ID(RS)T-0260-81-Pt-2) 28 Aug. 1981 p 412-413 refs Transl. into ENGLISH from Recent Selected Papers of NW Polytech. Univ., pt. 2 (Xian Shaanxi), 1979 (For primary document see N82-10996 01-99)
Avail: NTIS HC A18/MF A01

Certain design considerations (including discernment, analysis, and suppression) regarding combustion instability of solid rocket motors are discussed. The major focus is on the combustion instability of solid rocket motors with tubular or multitubular grains. R.C.T.

N82-11012# Ames Lab., Iowa.
AMES LABORATORY RESEARCH REPORT, 1980
1980 100 p
(Contract W-7405-eng-82)
(DE81-027399; IS-4767) Avail: NTIS HC A05/MF A01

Some of the research activities at Ames Laboratory described include coal research, solar cells, solar space heating of buildings, superconducting wires, coal carcinogens, lasers, solid waste recovery, nuclear physics, and high energy physics. Publications are listed. DOE

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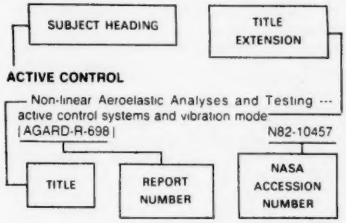
Typical Subject Index Listing



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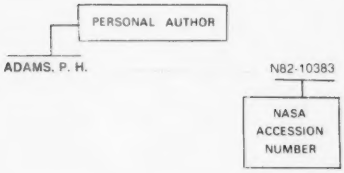

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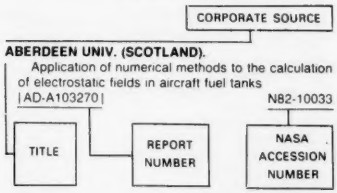

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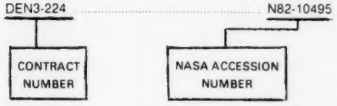

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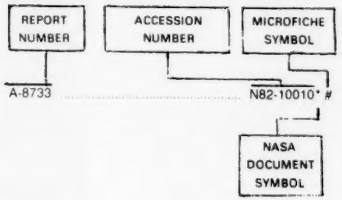

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DFVLR-FB-79-37 ..... N82-10099 #
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DFVLR-FB-80-19 ..... N82-10019 #
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DFVLR-FB-81-09 ..... N82-10409 #
DFVLR-FB-81-12 ..... N82-10017 #
DFVLR-FB-81-14 ..... N82-10002 #

DFVLR-MITT-79-13 ..... N82-10107 #
DFVLR-MITT-79-16 ..... N82-10045 #
DFVLR-MITT-79-21 ..... N82-10774 #
DFVLR-MITT-80-02 ..... N82-10453 #
DFVLR-MITT-80-05 ..... N82-10046 #
DFVLR-MITT-81-03 ..... N82-10231 #
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DOE/BETC/OR-19 ..... N82-10478 #

DOE/BETC/QPR-80/4 ..... N82-10250 #

DOE/CE-20088/01 ..... N82-10550 #

DOE/CS-20300/2 ..... N82-10522 #
DOE/CS-40037/T2 ..... N82-10262 #

DOE/DP-40071/T1 ..... N82-10393 #

DOE/EIA-0297 ..... N82-10474 #

DOE/ER-0105 ..... N82-10117 #
DOE/ER-0106 ..... N82-10116 #
DOE/ER-01148 1982 ..... N82-10926 #
DOE/ER-01367/T1 ..... N82-10925 #
DOE/ER-01764/T2 ..... N82-10849 #
DOE/ER-02407/9 ..... N82-10122 #
DOE/ER-02422/29 ..... N82-10432 #
DOE/ER-03023/T1 ..... N82-10634 #
DOE/ER-03162/T1 ..... N82-10520 #
DOE/ER-03244/T3 ..... N82-10830 #
DOE/ER-03992/448 ..... N82-10296 #
DOE/ER-03992/452 ..... N82-10831 #
DOE/ER-04694/T1 ..... N82-10829 #
DOE/ER-10451/2 ..... N82-10382 #
DOE/ER-10475/2 ..... N82-10198 #
DOE/ER-10554/8 ..... N82-10151 #
DOE/ER-10558/2 ..... N82-10521 #
DOE/ER-10765/T1 ..... N82-10940 #
DOE/ER-10814/1 ..... N82-10202 #

DOE/ET-5047/1 ..... N82-10527 #
DOE/ET-5047/2 ..... N82-10528 #
DOE/ET-5047/5 ..... N82-10529 #
DOE/ET-5047/9D ..... N82-10530 #
DOE/ET-5047/12 ..... N82-10574 #
DOE/ET-10152/T6 ..... N82-10260 #
DOE/ET-10154/T9 ..... N82-10261 #
DOE/ET-10296/T2 ..... N82-10251 #
DOE/ET-10325/T11 ..... N82-10152 #
DOE/ET-10445/1 ..... N82-10141 #
DOE/ET-10626/T1 ..... N82-10149 #
DOE/ET-11053/T1 ..... N82-10888 #
DOE/ET-13108/T14 ..... N82-10255 #
DOE/ET-13511/T8 ..... N82-10404 #
DOE/ET-14674/16 ..... N82-10257 #
DOE/ET-14879/T6 ..... N82-10143 #
DOE/ET-14928/1 ..... N82-10259 #
DOE/ET-15415/1 ..... N82-10336 #
DOE/ET-15518/5 ..... N82-10882 #
DOE/ET-20279/T8 ..... N82-10333 #
DOE/ET-20279/130 ..... N82-10558 #
DOE/ET-20279/140 ..... N82-10519 #
DOE/ET-23010/T10 ..... N82-10518 #
DOE/ET-25407/1 ..... N82-10540 #
DOE/ET-27225/9 ..... N82-10366 #
DOE/ET-41900/6 ..... N82-10847 #
DOE/ET-41900/8 ..... N82-10848 #
DOE/ET-53036/27 ..... N82-10885 #
DOE/ET-53042/24 ..... N82-10884 #
DOE/ET-53048/T1 ..... N82-10832 #
DOE/ET-53088/15 ..... N82-10883 #
DOE/ET-53088/30 ..... N82-10800 #
DOE/ET-60058/T1 ..... N82-10517 #

DOE/EV-01340/1 ..... N82-10592 #
DOE/EV-02958/T1 ..... N82-10148 #
DOE/EV-03264/20 ..... N82-10705 #
DOE/EV-04733/T1 ..... N82-10704 #
DOE/EV-06047/1 ..... N82-10593 #
DOE/EV-10403/3 ..... N82-10839 #
DOE/EV-10404/T4 ..... N82-10147 #
DOE/EV-10404/2 ..... N82-10145 #
DOE/EV-10404/6 ..... N82-10146 #
DOE/EV-10539/T1 ..... N82-10654 #

DOE/FC-02101/18 ..... N82-10249 #

DOE/ID-12014/T1 ..... N82-10562 #

DOE/JPL-954355-81/18 ..... N82-10497* #
DOE/JPL-955089-81/12 ..... N82-10500* #
DOE/JPL-955648-81/6 ..... N82-10498* #
DOE/JPL-955688-80/1 ..... N82-10499* #

DOE/NASA/0180-3 ..... N82-10506* #
DOE/NASA/0224-1-VOL-3 ..... N82-10495* #
DOE/NASA/51044-22 ..... N82-10503* #

DOE/NOAA-OTEC-35 ..... N82-10586 #

DOE/NV-10039/3 ..... N82-10475 #
DCE/NV-10061/7 ..... N82-10411 #

DOE/OR-05784/1 ..... N82-10833 #

DOE/PC-30239/T2 ..... N82-10252 #
DOE/PC-30292/3 ..... N82-10155 #
DOE/PC-30294/3 ..... N82-10158 #
DOE/PC-30298/T3 ..... N82-10150 #
DOE/PC-30300/T3 ..... N82-10157 #
DOE/PC-30305/T3 ..... N82-10586 #
DOE/PC-30306/T3 ..... N82-10159 #
DOE/PC-40770/T2 ..... N82-10144 #
DOE/PC-40787/1 ..... N82-10939 #
DOE/PC-41035/1 ..... N82-10154 #

DOE/PE-70278/T15 ..... N82-10601 #

DOE/RL-10121/T1 ..... N82-10526 #

DOE/SF-10610/T1 ..... N82-10923 #
DOE/SF-10802/T4 ..... N82-10516 #

DOE/SR/WM-79/3-REV-5/81 ..... N82-10858 #

DOE/TIC-11452 ..... N82-10269 #
DOE/TIC-1023186 ..... N82-10865 #
DOE/TIC-1028678 ..... N82-10525 #

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D180-25927-2 ..... N82-10326 #

E-985 ..... N82-10195* #
E-991 ..... N82-10503* #

ECR-105 ..... N82-10734 #
ECR-106 ..... N82-10448 #

ED-AX-225 ..... N82-10325* #

EGG-GTH-5474 ..... N82-10201 #

EGG-2113 ..... N82-10591 #

EOARD-TR-81-9 ..... N82-10033 #

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EPA-600/2-81-091 ..... N82-10606 #
EPA-600/2-81-095 ..... N82-10607 #
EPA-600/2-81-096 ..... N82-10388 #
EPA-600/4-01-034 ..... N82-10605 #

EPRI-AP-1882-VOL-2 ..... N82-10253 #
EPRI-AP-1882-VOL-3 ..... N82-10254 #
EPRI-AP-1889-VOL-1 ..... N82-10406 #
EPRI-AP-1889-VOL-2 ..... N82-10407 #
EPRI-AP-1933 ..... N82-10405 #
EPRI-AP-1940 ..... N82-10515 #
EPRI-AP-1943 ..... N82-10403 #
EPRI-AP-1959 ..... N82-10524 #

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EPRI-CS-1958 ..... N82-10828 #

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EPRI-EL-1836 ..... N82-10599 #
EPRI-EL-1916 ..... N82-10330 #
EPRI-EL-1953 ..... N82-10329 #
EPRI-EL-2016 ..... N82-10331 #

EPRI-EM-1589-VOL-1 ..... N82-10527 #
EPRI-EM-1589-VOL-2 ..... N82-10528 #
EPRI-EM-1589-VOL-3 ..... N82-10546 #
EPRI-EM-1589-VOL-5 ..... N82-10529 #
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EPRI-EM-1589-VOL-12 ..... N82-10574 #
EPRI-EM-1866-VOL-2 ..... N82-10564 #

EPRI-NP-1824 ..... N82-10275 #
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ERS-E-240 ..... N82-10387 #
ERS-E-246 ..... N82-10449 #
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ERS-E-273 ..... N82-10343 #
ERS-E-276 ..... N82-10735 #

ESA-CR(P)-1435 ..... N82-10098 #
ESA-CR(P)-1437-VOL-1 ..... N82-10486 #
ESA-CR(P)-1437-VOL-2 ..... N82-10487 #
ESA-CR(P)-1439 ..... N82-10344 #
ESA-CR(P)-1441-VOL-1 ..... N82-10104 #
ESA-CR(P)-1443 ..... N82-10488 #

ESA-TT-646 ..... N82-10018 #
ESA-TT-658 ..... N82-10657 #
ESA-TT-660 ..... N82-10107 #
ESA-TT-666 ..... N82-10045 #
ESA-TT-669 ..... N82-10774 #
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ESA-TT-674 ..... N82-10019 #
ESA-TT-679 ..... N82-10046 #
ESA-TT-681 ..... N82-10036 #
ESA-TT-695 ..... N82-10108 #
ESA-TT-698 ..... N82-10113 #

ESD-TR-81-7 ..... N82-10922* #
ESD-TR-81-98 ..... N82-10292 #

ESG-DOE-13352 ..... N82-10848 #
ESG-DOE-13363 ..... N82-10251 #

ESS/SS-1023 ..... N82-10098 #

ETL-R025 ..... N82-10630 #

ETL-0260 ..... N82-10105 #

FAA-EE-81-4 ..... N82-10812 #

FCTC/CCVS74EG-81/16 ..... N82-10742 #
FCTC/CCVS74UG-81/17 ..... N82-10741 #

FCTC/TR-81/18 ..... N82-10740 #

FE-2270-80 ..... N82-10261 #
FE-2706-43 ..... N82-10888 #
FE-10152-65 ..... N82-10260 #

FOA-A-30023-E4 ..... N82-10300 #
FOA-A-40034-C2/A2/ B2 ..... N82-10722 #

FOA-C-10166-M6(H9) ..... N82-10301 #
FOA-C-10172-M6 ..... N82-10763 #
FOA-C-20363-E3 ..... N82-10773 #
FOA-C-20366-D3 ..... N82-10112 #
FOA-C-20367-D3 ..... N82-10942 #
FOA-C-20372-D4(A3) ..... N82-10445 #
FOA-C-20373-D4(A3) ..... N82-10446 #
FOA-C-20374-D6 ..... N82-10783 #
FOA-C-20376-A2 ..... N82-10842 #
FOA-C-20377-A2 ..... N82-10843 #
FOA-C-20379-D2 ..... N82-10096 #
FOA-C-20388-F9 ..... N82-10024 #
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